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THESIS

**THE BIOTERRORISM THREAT BY NON-STATE
ACTORS: HYPE OR HORROR?**

by

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December 2006

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This thesis provides a capabilities-based approach to assessing the bioterrorism threat from non-state actors. Through comparative case study, prior bioterrorism attacks are analyzed to assess capability in the three areas necessary to complete a biological weapons attack: obtaining or isolating a pathogen, weaponizing the agent, and employing or disseminating the weapon. The three cases are the Rajneeshee cult in 1984, the Aum Shinrikyo cult in the early 1990s, and the United States Postal System anthrax attacks of 2001. In contrast to current wisdom that employing biological weapons is too difficult for non-state actors, this thesis reveals a broad spectrum of capability in all studies in the areas necessary to culminate an attack. Application of these findings must be used to assess risk generally rather than against specific groups because capability is deemed to be extremely difficult to track. The thesis finds that a significant threat exists but not large enough to be over-hyped above other national security concerns. In light of this, recommendations are provided for U.S. biodefense policy emphasis in the areas of the nonproliferation regime, attribution capabilities, and defending against the changing nature of future attacks with a particular emphasis on the public health system.

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**THE BIOTERRORISM THREAT BY NON-STATE ACTORS: HYPE OR
HORROR?**

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I. INTRODUCTION: HOW SHOULD THE UNITED STATES ASSESS THE BIOTERRORISM THREAT?

A. PURPOSE

The U.S. government considers biological warfare and terrorism among the greatest threats to U.S. national security. President Bush stated on February 11, 2004, “armed with a single vial of a biological agent, small groups of fanatics, or failing states, could gain the power to threaten great nations, threaten the world peace. America, and the entire civilized world, will face this threat for decades to come. We must confront the danger with open eyes, and unbending purpose.”¹ Other experts are divided. Scholars such as Joshua Lederberg portray biological terrorism as a huge threat, while others, such as Milton Leitenberg, downplay the risks and believe the U.S. government is over-hyping the dangers and spending biodefense money in the wrong places.² What framework should the government use to assess the risk, and what is the actual threat level?

1. A Framework for Assessing the Threat

In today’s post-9/11 environment, assessing the terrorism threat is a top priority. Different methodologies exist for conducting a risk or threat analysis yet most generally utilize similar criteria for evaluation. Terrorist intent and capability, a potential weapon’s destructive power (criticality), society’s vulnerability to an attack, and terrorist capability to carry out an attack are common to many risk assessments.³ One construct for

¹ “Biodefense for the 21st Century,” (Washington, D.C.: The White House, April 28, 2004), <http://www.whitehouse.gov/homeland/20040430.html> (accessed December 2005).

² For an example of Lederberg’s commentary on the bioterrorism threat, see Joshua Lederberg, ed., *Biological Weapons: Limiting the Threat*, BCSIA Studies in International Security (Cambridge, MA: MIT Press, 1999). For an example of Leitenberg’s viewpoints on the bioterrorism threat and biodefense focus, see Milton Leitenberg, “Bioterrorism Hyped,” *Los Angeles Times*, Los Angeles, CA: February 17, 2006, B13, <http://proquest.umi.com.libproxy.nps.mil/pqdweb?index=0&did=988524331&SrchMode=1&sid=1&Fmt=3&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1156264511&clientId=11969> (accessed December 2006), and Milton Leitenberg, *Assessing the Biological Weapons and Bioterrorism Threat* (Carlisle, PA: Strategic Studies Institute, U.S. Army War College, December 2005), <http://www.strategicstudiesinstitute.army.mil/pdffiles/PUB639.pdf> (accessed December 2006).

³ For two examples of threat and risk assessment methodologies, see “Assessing and Managing the Terrorism Threat,” U.S. Department of Justice, Office of Justice Programs, Bureau of Justice Assistance, September 2005, <http://www.ncjrs.gov/pdffiles1/bja/210680.pdf> (accessed December 2006) and Raymond A. Zilinskas, “Bioterrorism Threat Assessment and Risk Management Workshop,” Final Report and Commentary Presented to the U.S. Department of Energy, Center for Nonproliferation Studies, Monterey Institute of International Studies, June 24, 2003, <http://cns.miis.edu/pubs/reports/pdfs/biorisk.pdf> (accessed December 2006).

assessing the terrorism threat encompasses all of these factors in three broad areas:
Threat = Vulnerability x Intent x Capability.⁴

Vulnerability. U.S. vulnerability to any type of terrorism is undeniable no matter how many resources are invested in the problem. In congressional testimony, Secretary of Homeland Security, Michael Chertoff, concedes that the country cannot defend against all attacks without bankrupting the government.⁵ The United States is and will always be vulnerable to some level of terrorism which varies depending on the type and intended target.

Intent. Many times terrorist intent is difficult to interpret especially now that terrorist groups have crossed the threshold from traditional attacks to utilizing unconventional means. These include truck bombings as in the Oklahoma City and African Embassy bombings and suicide bombings such as those of the USS Cole and the 9/11 attacks. Terrorist attempts to use biological weapons (BW) have increased in the past twenty years as well. The Rajneesh cult in 1984 in Oregon, Aum Shinrikyo in Japan from 1990 to 1994, an unknown perpetrator spreading anthrax in the fall of 2001, and the ricin plot in the United Kingdom in 2002 are relatively recent examples. Al Qaeda still has the intent to employ BW today. It pursued BW as discovered during U.S. military operations in Afghanistan in late 2001 to early 2002. In September 2006, Iraqi Al Qaeda leader, Abu Hamza al-Muhajir, released an audiotape calling for scientists and experts in explosives to join the jihad and test unconventional biological and nuclear (dirty) bombs on the United States.⁶

Intent is a variable uncontrollable by the U.S. government and demanding to assess. Unlike intent, determining the vulnerability of U.S. assets to terrorism is difficult

⁴ Richard F. Pilch, “The Bioterrorist Threat in the United States,” in *Terrorism and Counterterrorism: Understanding the New Security Environment*, ed. Russell D. Howard and Reid L. Sawyer (Guilford, CT: MacGraw-Hill/Dushkin, 2002), 208.

⁵ Eric Lipton, “U.S. Can’t Protect All Targets, Chertoff Says,” *New York Times*, New York, NY: September 13, 2006, A21, <http://proquest.umi.com.libproxy.nps.navy.mil/pqdweb?index=194&did=1126493951&SrchMode=3&sid=1&Fmt=3&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1158248471&clientId=11969&aid=1> (accessed December 2006).

⁶ “Audiotape From Al Qaeda In Iraq Leader Calls on Scientists to Join Jihad,” *Fox News*, September 28, 2006, <http://www.foxnews.com/story/0,2933,216262,00.html> (accessed December 2006).

yet possible. The country can at least take action to mitigate terrorist attacks.⁷ In contrast, assessing and influencing intent is extremely difficult due to the thousands of terrorist groups and potential lone actors, causing intelligence assets to be too over-tasked and unable to realistically assess them all. Scientist-in-Residence of the Chemical and Biological Weapons Nonproliferation Program at the Center for Nonproliferation Studies, Richard Pilch states, “while it is of course possible to have a best guess with respect to this issue, there is always some underlying level of uncertainty. Thus, from a policy-making standpoint intent must be assumed.”⁸

Capability. Revisiting the equation, Threat = Vulnerability x Capability x Intent, a framework for assessing the bioterrorism risk becomes clearer. If threat is evaluated in terms of only vulnerability, the overall risk is astronomical. The United States is very vulnerable because of the vast spectrum BW agents can be employed across, and as Secretary Chertoff says, completely eliminating vulnerability is impossible. If the threat is measured only in terms of terrorist intent, risk must be assumed because ascertaining it from the thousands of groups worldwide is perhaps even more challenging. Threat must be assumed to be high from this perspective as well.

If threat is measured in terms of capability, the level of risk can vary from negligible to extremely high. Capability allows for variation away from just a high threat level despite vulnerability and intent driving the overall assessment to this point. For these reasons, capability becomes the one factor in the equation that allows for varying risk assessments for bioterrorism and more importantly, offers a balanced approach to this problem. The necessity exists for the government to gauge BW terror capabilities in order to realistically determine the threat.

2. Thesis Argument

The bioterrorism threat from non-state actors is real and significant. In the past, attacks succeeded because groups achieved capability in the areas necessary to carry out such an attack. These include: obtaining or isolating pathogens, weaponizing agents, and

⁷ For information on the government task of assessing vulnerability to critical infrastructure and key assets, see *The National Strategy for The Physical Protection of Critical Infrastructures And Key Assets* (Washington, D.C.: The White House, February 2003), http://www.whitehouse.gov/pcipb/physical_strategy.pdf (accessed December 2006).

⁸ Pilch, “The Bioterrorist Threat in the United States,” 233.

effectively employing the biological weapon.⁹ When they failed to successfully employ the weapon, groups either postponed or terminated bioweapons development of their own accord or were interdicted by authorities. They did not necessarily succumb to technical challenges and lack of capability. They either stopped or were stopped along the way. Furthermore, in the cases where groups failed, capability existed to eventually overcome most technical problems had they not terminated operations. If this argument proves correct, the threat of BW use by terrorists exists and is not over-hyped.

Analyzing prior bioattacks for capability is relevant to the threat picture today and in the future. As terrorists groups gain capability through personal trial and error and the experiences of others, the overall level of risk increases. By revealing the fundamental capabilities of past bioterrorists, the United States can better ascertain where the minimum capability was and how that has evolved over time. Knowing this permits better threat assessment which in turn drives more effective biodefense policy to enhance national security. This thesis explores three historical cases to determine what factors impact the outcome of the attacks. The cases are the Rajneeshee cult's use of salmonella in 1984 in the United States, the anthrax attacks in the United States during the fall of 2001, and the Aum Shinrikyo cult's attempted use of anthrax and botulinum toxin during the early 1990s in Japan. The overall threat assessment developed in this thesis stems from the terrorists groups' capability revealed in these studies. The thesis concludes with recommendations to U.S. biodefense policy based on this assessment.

B. BACKGROUND

Potential biological agent use runs the gamut from agroterrorism destroying large amounts of produce or livestock—to minor sicknesses such as salmonella poisoning—to unleashing a full-scale pandemic such as smallpox killing millions of people. Biological terrorism benefits from greater numbers of microbiologists and associated technicians

⁹ Three requirements to successfully carry out a biological weapon attack are cited broadly across the literature. For three examples, see Leitenberg, "Bioterrorism Hyped," John Mintz, "Technical Hurdles Separate Terrorists From Biowarfare," *The Washington Post*, Washington, D.C.: December 30, 2004, A1, <http://proquest.umi.com.libproxy.nps.mil/pqdweb?index=17&did=772016871&SrchMode=1&sid=9&Fmt=3&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1160764359&clientId=11969> (accessed December 2006), and Leitenberg, *Assessing the Biological Weapons and Bioterrorism Threat*.

than either the nuclear or chemical weapons communities offer worldwide.¹⁰ Additionally, open-source material availability on the subject, ever-increasing gains in biotechnology sciences, and the inexpensive equipment needed to produce BW make these types of weapons a tantalizing choice for terrorists.¹¹

1. Effects of Biological Weapons

The possible effects of BW make it appealing to terrorist groups considering weapons of mass destruction (WMD) attacks. Viruses, bacteria, and toxins have different potential for producing casualties yet all are useful in different scenarios. Similar to nuclear or chemical weapons, BW can produce significant devastation. A one megaton hydrogen bomb could kill anywhere from 500,000 to nearly two million people. An aerial delivery of 1,000 Kg of Sarin nerve gas could kill up to 10,000 individuals depending upon environmental conditions. In contrast, in the same aerial delivery and variable conditions, 100 Kg of anthrax may kill over 100,000 to nearly three million people.¹² The large infrastructure and expenses of developing or acquiring a nuclear weapon make it less inviting for terrorist groups. Both chemical and biological weapons can be manufactured with a much smaller footprint than nuclear weapons. Moreover, biotechnology today allows BW development to be conducted in extremely small areas with easily obtainable equipment. These relatively low barriers to entry combined with the high potential for casualties make the BW terror threat important to assess correctly.

2. The Dual-Use Dilemma

The footprint of the equipment and material necessary to manufacture biological weapons is very small compared to that of nuclear or even chemical weapons. More importantly, almost all of these items are dual-use in nature, meaning they would be found legally in pharmaceutical laboratories or in biological weapons facilities. Very few

¹⁰ Steven M. Block, "The Growing Threat of Biological Weapons," *American Scientist*, Vol. 89, Iss. 1, January-February 2001, <http://proquest.umi.com.libproxy.nps.navy.mil/pqdweb?index=29&did=65527749&SrchMode=3&sid=1&Fmt=3&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1161115645&clientId=11969&aid=1> (accessed December 2006).

¹¹ U.S. Congress, Office of Technology Assessment, *Proliferation of Weapons of Mass Destruction: Assessing the Risks*, OTA-ISC-559 (Washington, DC: U.S. Government Printing Office, August 1993), 38, <http://www.anthrax.mil/documents/library/proliferation.pdf> (accessed December 2006).

¹² *Biotechnology, Weapons and Humanity*, British Medical Association (United Kingdom: Harwood Academic Publishers, 1999), 25, and U.S. Congress, Office of Technology Assessment, *Proliferation of Weapons of Mass Destruction*.

differences exist between the two manufacturing processes until one decides to disseminate a weapon instead of manufacture a vaccine. Figure 1 illustrates this dual-use dilemma:

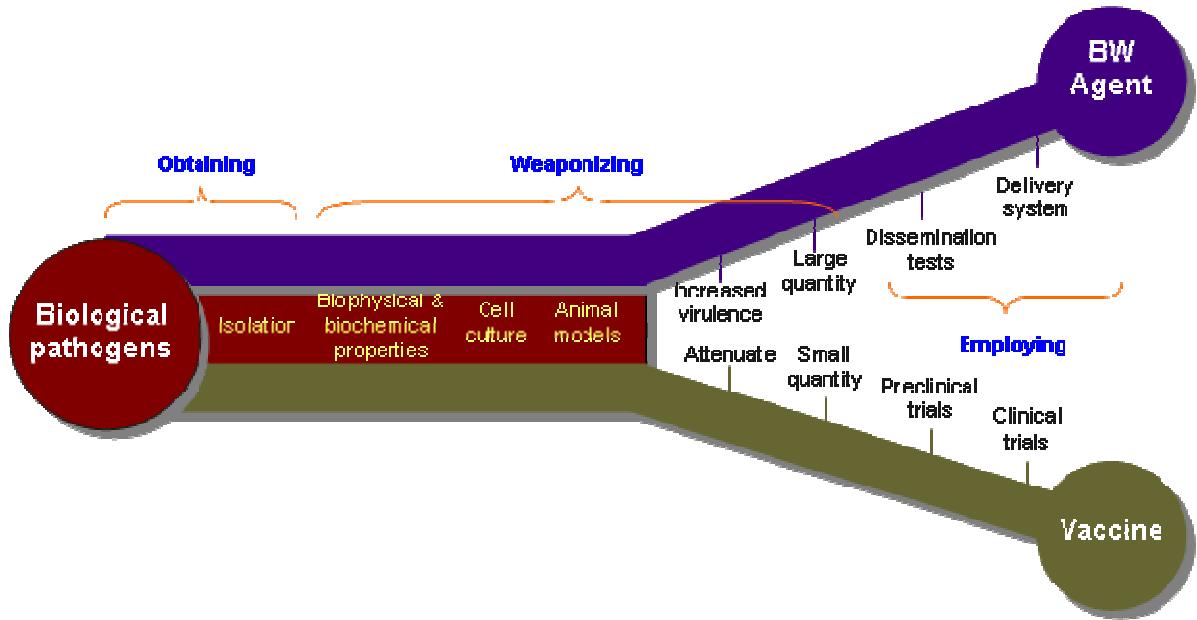


Figure 1. The Dual-Use Dilemma¹³

Both production methods must somehow obtain or naturally isolate a pathogen. Next, they manipulate the pathogen to gain the desired properties of the agent whether for vaccines or virulence of a weapon. The two processes diverge slightly during employment of a weapon versus vaccine; however, the equipment and technology needed to do either are similar if not exactly the same. Furthermore, large stockpiles are not necessary with biological weapons. Until actually needed, a virulent specimen can be kept in small quantities awaiting full-scale production in order to keep the footprint small. Since the dual-use problem exists, proliferation of biological weapons can be done easily and has progressed over the past few decades.

¹³ Peter R. Lavoy, "Today's WMD Threat: Are We Prepared?" Class Lecture, Counterproliferation, Department of National Security Affairs, Naval Postgraduate School, Monterey, CA: October 2005.

3. Proliferation of Biological Weapons

Proliferation of biological weapons by countries around the world is troubling. The Biological Toxin and Weapons Convention (BTWC) was signed in 1972 and went into force in 1975. Since then “the number of countries possessing or actively pursuing BW has more than doubled, from five to roughly a dozen today, including some member-states of the Convention.”¹⁴ The increase in the number of countries with BW capabilities increases the chances a terrorist group will obtain agents, technology, or hands-on assistance.

The number of sub-state agencies holding deadly pathogens around the world is staggering and exacerbates the problems associated with state proliferation. The World Federation of Culture Collections (WFCC) is an association of 472 germ repositories spanning 61 countries. Forty-six germ banks contain anthrax according to the WFCC. Another 1,000 germ banks throughout the world are not members of the group and those locations are not properly controlled.¹⁵ As late as 2004, a Department of Health and Human Services report which studied handling and security of select agents at 11 U.S. universities said, “Serious weaknesses compromised the security of select agents at all universities reviewed.”¹⁶ With nearly 1,500 germ banks worldwide and security questioned at two-thirds of them, the threat of terrorist groups gaining access to dangerous agents is undeniably real.

4. U.S. Vulnerability to Biological Weapons

Vulnerability of the United States to bioterrorism exists in two major areas: 1) agriculture to include crops and livestock and 2) society in general. Bioterrorism’s potential use against agriculture is staggering. Post-9/11, agriculture and its associated

¹⁴ “Limiting the Acquisition and Use of Biological Weapons by Strengthening the BWC,” *Nuclear Threat Initiative*, NTI WMD411, Center for Nonproliferation Studies, http://www.nti.org/f_wmd411/f2j.html (accessed December 2006) and “Chemical and Biological Weapons: Possession and Programs Past And Present,” Chemical and Biological Weapons Resource Page, Center for Nonproliferation Studies, <http://www.cns.miis.edu/research/cbw/possess.htm> (accessed December 2006).

¹⁵ Cited in Michael Barletta, Amy Sands, and Jonathan B. Tucker, “Keeping Track of Anthrax: The Case for a Biosecurity Convention,” *Bulletin of the Atomic Scientists*, vol. 58, no. 3, May/June 2002, 57-62, http://www.thebulletin.org/article.php?art_ofn=mj02barletta (accessed December 2006).

¹⁶ The Public Health Security and Bioterrorism Preparedness and Response Act of 2002 did improve overall select agent security at U.S. institutions after full implementation in late 2003. “Summary Report On Select Agent Security At Universities,” Department of Health and Human Services, Office of Inspector General, March 2004, 2, <http://oig.hhs.gov/oas/reports/region4/40402000.pdf> (accessed December 2006).

infrastructure were added to the national list of critical infrastructure and key assets as an area necessary to protect.¹⁷ Agriculture accounts for one-sixth of the U.S. gross domestic product, employs the largest number of workers of any employment segment, and accounts for over \$50 billion per year in economic exports.¹⁸ Bioattacks against this sector concern not only edibility of food for consumption but economic markets and the American confidence in the government's ability to protect a vital commodity.

Society in general is susceptible to attacks as well. The Rajneeshee's salmonella attack perpetrated through restaurant salad bars and the anthrax attacks of 2001 committed via the U.S. postal system clearly illustrate this point. Terrorists can and have attacked a vast array of targets with anything from mild pathogens to very deadly ones, instilling fear and making a bold statement about a group's ability to inflict damage.

5. Historical Focus on Biological Terrorism

Bioterrorism received little attention in the United States until the mid-1990s. The first publicly recognized U.S. bioattack prior to October of 2001 was perpetrated by the Rajneeshees in 1984, but the attack was not officially attributed as a BW attack until 1997.¹⁹ In the past ten years, there have been three monumental biological terrorism events. The Aum Shinrikyo cult attempted multiple bioattacks in Japan during the early to mid-1990s; anthrax was employed through the USPS in 2001; and Al Qaeda was discovered to be much further along than previously believed in their BW development.²⁰ The modern age of bioterrorism arrived 20 years ago and has been slowly progressing, but the United States missed recognizing its arrival.

Attention to the problem of bioterrorism has varied widely during this time and has failed to touch on some of the core issues, specifically the reasons behind the outcomes of bioattacks and what capabilities exist in sub-state groups to determine threat. When the literature does address the issue, experts are divided on the threat level.

¹⁷ *The National Strategy for The Physical Protection of Critical Infrastructures And Key Assets*, 36.

¹⁸ Henry S. Parker, "Agricultural Bioterrorism: A Federal Strategy to Meet the Threat," McNair Paper no. 65, March 2002, x, <http://www.au.af.mil/au/awc/awcgate/ndu/mcnair65.pdf> (accessed December 2006).

¹⁹ W. Seth Carus, *Bioterrorism and Biocrimes: The Illicit use of Biological Agents since 1900* (Washington, D.C.: Center for Counterproliferation Research, National Defense University, 1998), 4, <http://library.nps.navy.mil/uhtbin/hyperion/CCFull.pdf> (accessed December 2006).

²⁰ Leitenberg, *Assessing the Biological Weapons and Bioterrorism Threat*, 26-27.

C. DISAGREEMENT ON THE THREAT LEVEL

Expert opinions about the bioterrorism threat level reflect a large range of beliefs. When analyzing the literature, disagreement characterizes the discussion with most falling near the Lederberg or Leitenberg schools of thought.

Joshua Lederberg, Professor Emeritus and Sackler Foundation Scholar at Rockefeller University, believes a major BW threat exists worldwide. BW's potential lethality combined with great unpredictability make the threat what it is today. Lederberg hints at capability being the issue in his concern over the acceleration of biotechnology and science.²¹ He believes amateur bioterrorists could cause over a thousand casualties while terrorist groups with good monetary funding could cause 10 ten to 100 times that amount of damage. Lederberg thinks that U.S. vulnerability to BW attacks is high, and that the threat, "is probably the most perplexing and gravest security challenge we face."²²

In the opposing camp, a senior research scholar at the University of Maryland, Milton Leitenberg, believes the specter of bioterrorism to be greatly exaggerated. The ideas of terrorism and biological weapons were merged into a single threat, causing bioterrorism to receive undue attention. In reality, state BW programs were a large threat in the 1990s, but their combination with terrorism or bioterrorism was not a problem.²³ Leitenberg focuses most exclusively on capability as does this thesis, but his conclusions focus on what others in the scholarly and policy communities have exaggerated and on unrealistic exercise scenarios used by the U.S. government.²⁴ He does not delve into the reasons causing the outcomes of the bioattacks. In general, he believes the U.S. government should move away from preparing for high-casualty attacks and strengthen the public health system to deal with more realistic scenarios such as flu pandemics and other natural outbreaks that kill thousands each year.

²¹ Joshua Lederberg, "Epilogue," in *Biological Weapons: Limiting the Threat*, ed. Joshua Lederberg, BCSIA Studies in International Security (Cambridge, MA: MIT Press, 1999), 325-327.

²² "Biological Warfare," News and Notes, Report Summary, *Emerging Infectious Diseases*, Centers for Disease Control and Prevention, vol. 7, no. 6 (November-December 2001), <http://www.cdc.gov/ncidod/eid/vol7no6/lederberg.htm> (accessed December 2006).

²³ Leitenberg, *Assessing the Biological Weapons and Bioterrorism Threat*, 43.

²⁴ Ibid, 43-64.

Bruce Hoffman of the RAND Corporation marginalizes the threat similarly to Leitenberg. He contends the U.S. government is over occupied with WMD terrorism, and any type of chemical, biological, or radiological weapons will be small-scale in nature to achieve a specific objective rather than mass destruction. Hoffman believes a biological attack could have great ramifications from economic and psychological perspectives, but that overweighting large-scale biological or WMD attacks misses the lessons learned from previous events.²⁵ To his and other optimists' defense, terrorists have not conducted a mass-casualty BW attack to date.

Jonathon Tucker, Director of the Chemical and Biological Weapons Nonproliferation Project at the Center for Nonproliferation Studies in Monterey, CA, sided more with Lederberg about the risk of bioterrorism but more recently shifted viewpoints. In his book, *Toxic Terror*, Tucker states too much analysis of threat has been accomplished from the perspective of vulnerability. With capability and intent of terrorist groups being the other elements of threat, he focused on motivation and intent in his study.²⁶ He concludes "society should be less concerned with the terrorist use of CBW [chemical and biological weapons] agents *per se*, and more concerned with mass-casualty terrorism from any source."²⁷ Tucker does not evaluate the threat from a capabilities perspective but warns of the large-scale devastation possible from BW use. More recently, he took on a more skeptical stance on the Bush administration's threat assessments focusing on genetically-engineered pathogens. Tucker downplays this for several reasons: terrorists lack the technology necessary for the task, predicting terrorist

²⁵ After dinner address delivered at the "Terrorism and Beyond: The 21st Century" Conference, co-sponsored by the Oklahoma City National Memorial Institute for the Prevention of Terrorism and The RAND Corporation, 17 April 2000, <http://www.mipt.org/hoffman-ctb.asp#title> (accessed December 2006). For additional perspective from Hoffman, see: Bruce Hoffman, *Inside Terrorism* (New York: Columbia University Press, 1998), 185-213.

²⁶ Jonathon B. Tucker, "Introduction," in *Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons*, ed. Jonathon B. Tucker, BCSIA Studies in International Security (Cambridge, MA: MIT Press, 2000), 1.

²⁷ Jonathon B. Tucker, "Lessons From The Case Studies," in *Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons*, ed. Jonathon B. Tucker, BCSIA Studies in International Security (Cambridge, MA: MIT Press, 2000), 268.

intentions is difficult and unreliable, and this type of work could be construed to violate the BTWC causing a BW arms race.²⁸

Similarly to Tucker, Senior Fellow at the Belfer Center for Science and International Affairs at Harvard University, Jessica Stern analyzes the threat more from a terrorist motivation and organizational structure perspective but does touch briefly on capability. She minimizes the number of groups interested in any type of WMD use and even more so mass casualties. This assessment, along with her belief that the BW technical obstacles are difficult to overcome, dictates a reduced risk; however, she thinks the U.S. government must be ready for unconventional terrorism—mostly in the area of consequence management because she concedes attacks will inevitably happen.²⁹

Other experts are staunch supporters of the Lederberg threat assessment and some even take it further. One such individual is Steven Block, Professor of Biological Sciences and Applied Physics at Stanford University and a member of JASON, a group of advisory scientists to the U.S. government. He perceives the BW risk from terrorist groups to be extremely high. Block suggests that just because the technical hurdles of acquisition and delivery are difficult and some experts over-exaggerate the simplicity of bioterrorism does not mean the country can disregard the threat. Terrorists groups can and will overcome those obstacles in ways currently unthinkable. He reasons that the fear generated by bioattacks combined with the public health system's vulnerability to being incapacitated make BW a grave threat.³⁰ Block alludes to capability in his assessment as the central idea behind the inherent BW threat in modern terrorist groups.

Leonard Cole, Adjunct Professor of Science at Rutgers-Newark in New Jersey, and Malcolm Dando, Director of the Bradford Disarmament Research Center at the University of Bradford, speak of the BW threat in similar terms. They foresee an expanding threat in the new century due to acceleration in biotechnology and non-state

²⁸ Jonathon B. Tucker, "Biological Threat Assessment: Is the Cure Worse Than The Disease?" *Arms Control Today*, October 2004, http://www.armscontrol.org/act/2004_10/Tucker.asp (accessed December 2006).

²⁹ Jessica Stern, "Terrorist Motivations and Unconventional Weapons," in *Planning The Unthinkable: How New Powers Will Use Nuclear, Biological, and Chemical Weapons*, ed. Peter R. Lavoy, Scott D. Sagan, and James J. Wirtz (Ithaca, NY: Cornell University Press, 2000), 227-229.

³⁰ Block, "The Growing Threat of Biological Weapons."

actors' possible use of BW not only in WMD attacks but in small-scale attacks against less expected targets. Cole states that prevention and detection become extremely difficult when a group or individual has the will, intent, and capability to perpetrate a BW attack.³¹ In this statement, he suggests that with the existence of intent, capability ultimately defines the threat.

Pilch assesses the threat solely as capability based; however, he does not find the threat to be high. Despite this similar assessment to Leitenberg, he concludes that the country must prepare for low probability yet high consequence events like anthrax due to their possible destruction on agriculture and society, the U.S. economy, and the American psyche.³² This view seems to mix vulnerability into the assessment by implying the country is extremely susceptible to bioattack effects. Preparing for the worst-case scenario is the only prudent course of action as if the threat were quite high—failure to not prepare is too disastrous. Staunch biodefense is required despite the threat level based purely on potential devastation.

As illustrated by this broad range of experts in the WMD and biological terrorism communities, threat of bioterrorism by non-state actors is judged to be high, low, and anywhere in between. These experts do not agree on how to assess the risk as shown by the focus of their studies: some focus on motivation or intent of terrorists, others focus on organizational structure of terrorist groups enabling them to attempt WMD attacks, and still others choose to review different aspects of group capability or simply U.S. vulnerability.

Leitenberg, Pilch, and others utilize certain aspects of capability to assess the bioterrorism threat but come to very different conclusions. This thesis uniquely uses multiple historical case studies to focus on capability and analyze reasons for different degrees of successful use of BW to add to the discussion on the actual risk both today and in the future.

³¹ Comments from Malcolm Dando and Leonard A. Cole, "Bioweapons, Proliferation, and the U.S. Anthrax Attack," Conference on Terrorism, Transnational Networks, and WMD Proliferation: Indications and Warning in an Era of Globalization, Naval Postgraduate School, Monterey, CA: July 25-27, 2006. For more on Cole's BW threat predictions, see: Leonard A. Cole, *The Eleventh Plague* (New York: W.H. Freeman and Company, 1997), 2-4.

³² Pilch, "The Bioterrorism Threat in the United States," 233.

D. CASE SELECTION AND METHODOLOGY

1. Case Selection

Three cases were selected: the Rajneeshees cult attacks in The Dalles, Oregon in 1984; the Aum Shinrikyo cult attacks from 1990 to 1994 in and around Tokyo, Japan; and the USPS anthrax attacks in the fall of 2001. The selections meet the following criteria necessary for this study: non-state actors perpetrated the attacks against human targets; the data for analysis is thorough with sources to validate the data; and all involve groups with different motivations, financial backgrounds, settings, and/or organizational structures (to alleviate conclusions that attack outcomes appear similar due to the type of organization). Although the U.S. anthrax attacks are unsolved to date, it is a critical case study for U.S. biodefense, and it would be remiss to leave it out of the study.

2. Methodology

Through comparative case study, common explanations are outlined for the outcomes of the attacks. Experts claim that bioterrorism fails for lack of capability in the complex tasks necessary to bring BW to fruition. To assess this claim, the cases are analyzed through a framework incorporating three major aspects of BW development that terrorist groups require for success—obtaining, weaponizing, and employing. In analyzing whether past bioattacks fail for reasons other than those based on purely capability, this thesis will show whether terror groups have actually developed multiple capabilities over time, which in turn might elevate the overall threat.

a. Analysis Criteria

To standardize the analysis across the three cases, ten criteria were selected to evaluate capability and levels of success. They fall within the three areas required to successfully carry out a BW attack:

- Obtaining or isolating the agent:
 - Did the group have legal or illegal access to the pathogen?
 - Did the group have the monetary resources to acquire the pathogen?
 - Did the group have legal access to order the pathogen from a germ bank?
 - Did the group have the ability to steal the pathogen from any laboratory setting?

- If unable to obtain the pathogen, did the group possess the technical ability to isolate it naturally?
- Weaponizing the agent:
 - Is the agent suitable for production?
 - Is the agent economically feasible for production?
 - Is the agent safe for those producing it?
 - Is the group capable of production of the selected agent?
 - Is the necessary equipment complex/difficult to obtain or simple/commonplace to acquire?
 - Is the technical expertise available for agent production?
- Employing the biological weapon:
 - Is the agent easily transported?
 - Is the agent easily disseminated?
 - Can the agent survive in the dissemination environment?
 - Is the pathogen highly infectious/sufficiently virulent to cause sickness and/or death?
 - Does natural widespread immunity exist against the pathogen?
 - Is viable protection available to those disseminating the agent?³³

These ten criteria and their sub-criteria are derived from common but broader aspects of BW implementation necessary for groups to overcome to successfully obtain, weaponize, and employ a weapon. Although other criteria exist, those selected are prevalent themes and others were developed to delve into the core of terrorist group capabilities necessary to accomplish the three major steps. Within the ten criteria where applicable, “availability” and “ease of use” are accounted for because they help characterize varying levels of success thereby impacting the overall threat. Since this thesis is analyzing capability to assess the overall threat, focusing on capabilities-based criteria facilitates uncovering groups’ inherent abilities and whether or not that ability has

³³ These criteria are generated from multiple descriptions of the criteria necessary for successful BW employment. For four examples, see Carus, *Bioterrorism and Biocrimes*, 22-24, *Technologies Underlying Weapons of Mass Destruction*, Background Paper United States Congress (Washington, D.C.: Office of Technology Assessment, 1993), 77, <http://www.fas.org/spp/starwars/ota/934405.pdf> (accessed December 2006), Jerrold M. Post, Laurita M. Denny, and Polina Kozak, “Weapons of Mass Destruction Terrorism,” in *Avoiding the Abyss: Progress, Shortfalls, and the Way Ahead in Combating the WMD Threat*, 2nd edition, ed. Jim A. Davis and Barry R. Schneider (Maxwell AFB, AL: USAF Counterproliferation Center, July 2005), 86, and Joseph Cirincione, Jon B. Wolfsthal, and Miriam Rajkumar, *Deadly Arsenals: Nuclear, Biological, and Chemical Threats*, 2nd ed. (Washington, D.C.: Carnegie Endowment for International Peace, 2005), 58-59.

improved over time and through other BW events. If other criteria not based on capability become apparent as reasons for failure, they are addressed as contributing factors. This approach helps to reveal non-capability issues to address with biodefense policy while simultaneously evaluating whether or not overcoming those hurdles for BW use is even possible for terrorist groups.

b. Defining Success

Defining success or failure in the context of a BW attack is an elusive task. If one looks for success against a terror group's strategic objectives, knowing a group's exact objectives of the attacks is crucial. In the case of both the Rajneeshees and Aum Shinrikyo, the objectives are thought to be known; however, despite all of the research and analysis of the groups, strategy remains somewhat ambiguous due to: the types of closed groups involved, lack of timeliness in the investigations, and in the case of Aum Shinrikyo, events taking place in a foreign country. The anthrax attacks of 2001 prove even more unclear from this perspective because assumptions must be made because strategy and objectives are unknown until the perpetrators are caught. Moreover, a terrorist group failing to meet objectives does not constitute lack of capability. Many factors outside the realm of this study could affect that facet of an attack despite a group having tactically employed BW successfully.

In order to isolate the definition of success used here from an actor's objectives, the case studies measure success from an operational point of view. Did the terrorist group tactically employ BW? To answer this question affirmatively, it necessitates the group accomplishing three phases. They must have obtained or isolated a pathogen, weaponized the agent, and deliberately employed it against a target regardless of the overall effect of the attack. All criteria evaluated within each phase are not required to classify all three phases a subsequent success and denote the attack as fully accomplished. This allows for varying levels of success to develop capability for subsequent BW use.

While the definition of success is important, the cornerstone of the thesis is not entirely in determining success or failure. The primary objective is twofold: 1) to determine if any groups succeeded in overcoming the technical obstacles to employing

BW to establish capability and 2) more importantly, if groups failed to tactically employ BW, determine why they failed—was it lack of capability or for other reasons? Leitenberg states with respect to the U.S. anthrax attacks that whether the perpetrator had outside help or independently developed these bioagents would greatly change the country’s view on the level of the bioterrorism threat.³⁴ His statement implies that how and why the terrorists succeeded in employing this dangerous agent greatly affects the nature of the bioterrorism threat. This thesis’ methodology aims to explain failures of these groups and the capability displayed in any successes in order to determine the overall threat posed by BW.

E. THESIS ORGANIZATION

This thesis contains five chapters and three case studies. Chapter I outlines the following: the bioterrorism threat dilemma; a literature review of terrorism experts’ opinions on the current threat level and generally how they analyzed the data to assess overall risk; a methodology to analyze each case; and a roadmap for the entire thesis.

Chapters II, III, and IV support the argument presented in Chapter I through comparative case studies. To the extent available, the chapters provide background on the terrorist groups. Information on pathogens, events leading up to the actual bioattacks and their effects follow this description. Each attack is then analyzed against the ten criteria within the three phases of an attack (obtaining/isolating, weaponizing, and employing). The conclusions in each case study comment on two areas based on the analysis: reasons for success or failure and assessed capability.

Chapter V integrates the analysis and lessons learned from each case study to synthesize a list of common capability-type attributes contributing to the outcome of previous bioattacks. It provides an overall capabilities-based threat assessment afforded by these findings, and recommends adjustments in U.S. biodefense policy. As stated, the chapter does not undertake a full policy analysis. Rather, it comments on current policy that may require adjustment based on the actual risk assessed.

³⁴ Leitenberg, “Bioterrorism Hyped.”

II. THE RAJNEESHEE CULT

A. INTRODUCTION

The Rajneeshee Cult employed a crude biological weapon and caused at least 751 known illnesses and 45 hospitalizations in September of 1984. Despite its tactical success in disseminating *Salmonella typhimurium*, the group failed to achieve its objective of obtaining control of the Wasco County, Oregon Commission by making a majority of the voting public sick on the day of elections. The cult created local hysteria and saturated the public health system; however, accomplishing the attacks nearly five weeks before the local elections negated any affect it had on the voting public.

The focus of this chapter is threefold. First, it determines the fundamental capabilities which allowed the group to obtain, weaponize, and employ the agent *S. typhimurium*. From these established capabilities, the chapter assesses tactical success or failure of the attacks and ascertains which capabilities directly affected the ensuing outcome. Third, it establishes a basis for assessing today's threat since the event was the first documented bioterrorism attack in the United States.

Although the Rajneeshees accomplished the first U.S. attack and the earliest one of the three cases selected, its importance is grounded in several other reasons as compared to the other studies: the covert nature of the attack, the use of a normally non-lethal agent, the lack of attribution until the group's leader came forward, and the large impact such an event had on local authorities even if that was not the objective. The cult's ability to carry out such an attack with these unique characteristics sheds light upon the nature of the BW threat. If a group can cause major consequences despite limited capability without attribution or anyone even being aware a bioattack happened, the BW risk may be greater than expected. In essence, this highlights the positive aspect of a capabilities-based assessment. Being aware of a group's ability in the BW realm or just knowing the general potential capability based upon agent, equipment, and technical expertise availability/capability, may prove to be indicative of the threat the government should prepare for.

The case also underscores the fallibility of a capabilities-based assessment as well. In Chapter I, intent was described as something too intangible to assess effectively. This chapter illustrates that capability becomes equally difficult to gauge due to the dual-use nature of biological manufacturing equipment and non-select agents, widespread technical expertise availability, and the quickly growing field of biotechnology and science. Judging an individual terrorist group's capability may be just as difficult as assessing intent. Knowing this limitation, the government being aware of the overall capability within the field and how it is evolving may prove to be the preferred use of the capabilities-based assessment. Additionally, this demonstrates that intent is necessary to evaluate threat, but capability must be looked at because without it, threat does not exist.

To begin, this chapter develops the background of the Rajneesh. It then explores how the group arrived at the point of WMD employment as a terrorism tactic and introduces key personnel in the organization. The analysis section investigates capabilities leading to tactical success in the three phases necessary for a biological terrorism attack: obtaining or isolating a pathogen, weaponizing the agent, and employing the agent. The chapter ends by discussing the basis for success or failure and summarizes the group's baseline capabilities. This chapter is the first piece in a unique capabilities-based risk assessment of bioterrorism from non-state actors.

B. BACKGROUND

1. Organization

Rajneesh Chandra Mohan founded a commune in Poona, India in 1974.³⁵ Prior to this, he earned a masters degree and then instructed philosophy at the University of Jabalpur in Jabalpur, India. Known by his most familiar name, Bhagwan Shree Rajneesh, he evolved into an Indian spiritual leader teaching a combination of Hinduism, Jainism, Buddhism, Taoism, and Christianity combined with many other practices of psychology and meditation.³⁶

³⁵ "Bhagwan Shree Rajneesh," Oregon Biographies, The Oregon History Project. The Oregon Historical Society. <http://www.ohs.org/education/oregonhistory/Oregon-Biographies-Bhagwan-Shree-Rajneesh.cfm> (accessed December 2006).

³⁶ "Osho, Formerly Known as Bhagwan Shree Rajneesh," Religious Tolerance, Ontario Consultants on Religious Tolerance, <http://www.relioustolerance.org/rajneesh.htm> (accessed December 2006).

Rajneesh gathered a significant following due to his open views on spiritual and sexual freedom. At one point, he nurtured over 200,000 followers in 600 meditation centers worldwide. One of his most faithful followers, Ma Anand Sheela, urged Rajneesh to immigrate to the United States. Finally due to heavy pressure from India's government to leave the country, he abruptly moved the group to Montclair, NJ. Sheela searched for a site throughout the country and finally settled on 65,000 acres called "Big Muddy Ranch" in rural eastern Oregon.³⁷

In the small county of Wasco (population approximately 20,000 in the mid-1980s), Rajneesh purchased the ranch just outside of the county seat of The Dalles, Oregon, for \$5.75 million.³⁸ Eventually, over 4,000 members settled within the completely self-contained commune. The cult started on friendly terms with the local population in the county, but the group quickly turned negative and aggressive towards the public's unenthusiastic reaction to its expansion and building violations. Due to Rajneesh's perceived threat to the commune from the local community, he enlisted 150 cult members to carry weapons to defend the borders of his "town" from the outside world.³⁹

The commune cultivated negative feelings within the Wasco County community but not among the entire local populace. A member of the planning commission during this time period, Dan Erickson, said that although he personally did not like the Rajneeshes for many reasons, they brought hard-working and educated people to the area and spent \$35 million building the ranch and its infrastructure. The cult infused a great deal of money into the local economy. Erickson added that despite fairly generous local support, if the county commission challenged the cult on building or zoning issues, the commission members were verbally attacked and even threatened.⁴⁰ Conflict between the local community and the commune appeared inevitable. By 1984, the cult's

³⁷ "Osho (or Ranjeeshism)," The Religious Movements Homepage Project, University of Virginia, <http://religiousmovements.lib.virginia.edu/nrms/rajneesh.html> (accessed December 2006).

³⁸ Judith Miller, Stephen Engelberg, and William J. Broad, *Germs: Biological Weapons and America's Secret War* (New York: Simon and Schuster, 2001), 15.

³⁹ W. Seth Carus, "The Rajneeshes (1984)," in *Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons*, ed. Jonathan B. Tucker, BCSIA Studies in International Security (Cambridge, MA: MIT Press, 2000), 118.

⁴⁰ Miller, Engelberg, and Broad, *Germs*, 17.

desire to change the county to their liking caused a clash of cultures that culminated in bioterrorist activity. The months prior to the Wasco County elections of November 1984 were the setting for these events.

2. Fundamental Issues and Strategy

The Rajneesh cult's fundamental problems were perceived undue interference by the Wasco County commission and the constraints imposed by the area zoning and land use restrictions. To correct this and achieve the goal of preventing any external influences over cult affairs, their overall strategy was to win jurisdiction of the county commission via local political elections.⁴¹

To accomplish this goal, the Rajneeshes devised and implemented many peculiar ideas. In 1982, they moved into the neighboring town of Antelope, Oregon, having a population of only 75. By physically outnumbering the town, the cult took over the Antelope town council giving them complete power over most aspects of the town's governmental affairs. For example, the Rajneeshes renamed the town Rajneesh. It took control over the local schools while also converting the only local business into a vegetarian restaurant called "Zorba the Buddha."⁴² These actions gave the cult control of the small town of Antelope but failed to solve their problems caused by the county.

Another strategy was to incorporate their small town located on the commune, named Rajneeshpuram, in order to work around the cult's violations of Oregon's land-use laws.⁴³ This legally allowed Rajneesh to field his own police department called the "Peace Force" with approximately 60 policemen. This police agency not only patrolled within the cult's walls, but it legally had the right to police the county roads. More strikingly, this permitted legal access to law enforcement training programs and crime data networks. Although the Rajneesh's peace officers did have access to Oregon's data, the Federal Bureau of Investigation (FBI) prohibited access to its National Crime Information Center database due to an ongoing civil-rights complaint investigation. The

⁴¹ Carus, "The Rajneeshes," 122-123.

⁴² Miller, Engelberg, Broad, *Germs*, 16.

⁴³ Carus, "The Rajneeshes," 119.

Wasco County locals repeatedly complained about Rajneesh policemen stopping and harassing them on country roads around the commune, which ultimately spurred the federal investigations.⁴⁴

In another strategic move, the Rajneesh's "Share-A-Home" program brought thousands of homeless individuals from around the United States to the commune and provided them a place to live. The cult then sought to register these people to vote on its behalf in the upcoming elections.⁴⁵ In a related matter, the Rajneeshes brainstormed moving cult members into The Dalles under false names to vote multiple times with aliases via absentee ballots. The group decided against this due to the fear of being caught by investigators uncovering this illegal voter registration campaign.⁴⁶

When none of the previous ideas achieved the objective for the Rajneeshes, the idea of making the Wasco County voting populace too sick to vote in the elections evolved. The cult hoped to cause low voter turnout and outnumber the local voting population of the county thereby giving the Rajneeshes the ability to "legally" have their candidates win the elections. The approximately 15,000 registered voters of Wasco County overwhelmed a commune numbering roughly 4,000 from a voting perspective. With low local voter turnout, the cult hypothesized it would have the numbers to vote for and elect the candidate(s) they supported during the elections.⁴⁷ The cult would then have control of the county commission allowing complete jurisdiction over any property issues and other expansion ideas.

Bioterrorism became the primary strategy to achieve the goal of taking over the Wasco County commission. This strategy combined with taking advantage of Oregon's voter registration laws with the Share-A-Home program appeared to the cult to be a sufficient plan to achieve the goal. To understand how this strategy came to realization, the leadership and those involved in the development of the strategy are reviewed next.

⁴⁴ Miller, Engelberg, and Broad, *Germs*, 16-17.

⁴⁵ Ibid, 17.

⁴⁶ Carus, "The Rajneeshes," 123.

⁴⁷ Ibid, 123-124.

3. Personnel

Although Rajneesh himself was the true leader of the commune, he did not run the day-to-day affairs. His private secretary, Sheela, primarily ran Rajneeshpuram since the group's arrival in 1981. Sheela, along with a handful of other high-ranking women who ran the commune, were called "Big Moms" and used the prefix of "Ma" in front of their names to denote this. Beneath Ma Sheela, many supervisors called only "Moms" managed specific areas of the day-to-day operations at the ranch. A third tier of cult leaders existed below the "Moms" who were considered advisors and closely tied to Sheela.⁴⁸ In effect, this small group ran the cult while Rajneesh endured a four-year vow of public silence.⁴⁹ Those working in his personal household disliked Ma Sheela, and in turn, she viewed them as a threat to her authority. A second group also challenged her authority because they enjoyed direct access to Rajneesh because of their wealth and fame associated with ties to Hollywood. A power struggle constantly existed about who had the power to accomplish tasks and how to carry out cult operations.⁵⁰

Ma Anand Puja ultimately spearheaded the biological weapons program for the cult. Puja was a native of the Philippines with an American nursing background. She had a close relationship with Sheela—the strong tie went back to their days together in Poona, India in the original commune.⁵¹ With these attributes, Puja supervised all medical operations at the commune. She was the secretary-treasurer of the Rajneesh Medical Corporation (RMC) and managed the Pythagoras Clinic and the Pythagoras Pharmacy.⁵²

Many cult members disliked Puja, often referring to her as "Dr. Mengele," associating her with Hitler's horrific Nazi regime. According to Ma Ava, a worker at the RMC Corporation during this time-frame, "Puja was feared and disliked by personnel at the RMC. Puja behaved as a tyrant."⁵³ She is also described as being a loner and highly

⁴⁸ Carus, "The Rajneeshes," 119-120.

⁴⁹ Miller, Engelberg, and Broad, *Germs*, 23.

⁵⁰ Carus, "The Rajneeshes," 120.

⁵¹ Miller, Engelberg, and *Germs*, 26.

⁵² Carus, "The Rajneeshes," 121.

⁵³ Ava Kay Avalos interrogation, transcribed October 22, 1985, Oregon Attorney General's Office, 3, cited in Carus, "The Rajneeshes," 121.

interested in death and poisons.⁵⁴ Puja was a dark soul with poor social skills and perhaps latent evil intentions—exacerbated by her access to Sheela.

C. ANALYSIS

1. Obtaining the Pathogens

The Rajneeshee cult chose to obtain pathogens legally from culture collections. It either lacked capability to naturally isolate pathogens or decided not to attempt it. Puja showed interest in several types of biological agents but eventually settled on only one at least initially. These agents included the following:

- *Salmonella typhi* (causes typhoid fever)
- *Salmonella typhimurium* (causes common salmonella poisoning)
- *Salmonella partyphi* (similar bacterium to *S. typhimurium*)
- *Francisella tularensis* (causes tularemia—an agent of Cold War bioresearch)
- *Enterobacter cloacae* (causes a large array of infections in almost any part of the body with high mortality rates but not in normally healthy people)
- *Neisseria gonorrhoeae* (causes the sexually transmitted disease gonorrhea)
- *Shigella dysenteriae* (causes very severe dysentery and possibly death)
- Human Immunodeficiency Virus (causes Autoimmune Deficiency Syndrome—AIDs)⁵⁵

Initially, she desired *S. typhi* to cause typhoid in the local populace; however, there was concern over attribution of such an attack to the cult. Instead, Puja chose *S. typhimurium*, causing common salmonella-type food poisoning in the local residents.⁵⁶ The cult ordered the bacteria legally through the RMC (as it was a state-licensed medical firm) from a Seattle-based company called VWR Scientific.⁵⁷

S. typhimurium causes salmonellosis. This infection triggers diarrhea, fever, and abdominal cramps that last anywhere from four to seven days. Usually, people do not

⁵⁴ Carus, “The Rajneeshees,” 121.

⁵⁵ Miller, Engelberg, and Broad, *Germs*, 26-27. For background information on these bacteria and the diseases they cause, see “Medicine, Ob/Gyn, Psychiatry, and Surgery – Infectious Diseases Articles,” E-Medicine from WebMD, http://www.emedicine.com/med/INFECTIOUS_DISEASES.htm (accessed December 2006).

⁵⁶ Miller, Engelberg, and Broad, *Germs*, 29.

⁵⁷ Carus, “The Rajneeshees,” 127.

require hospitalization unless they become severely dehydrated or the illness spreads out of the intestines. Once out of the intestines, antibiotics are required.⁵⁸

The cult contemplated and ordered more hazardous pathogens than *S. typhimurium*. An invoice from the American Type Culture Collection (ATCC) proved the Rajneeshees ordered and received delivery of agents causing typhoid fever, tularemia, and shigella dysentery. All are extremely dangerous bacteria that no doubt could have caused more casualties and even fatalities than *S. typhimurium* or if used in separate attacks. Authorities failed to find samples of these bacteria at the clinical laboratories; however, the criminal investigation discovering the invoice did not take place until a year after the salmonella attacks, giving those associated with the events many opportunities to dispose of the evidence. When discovered, these invoices were not shown to public health workers who would have realized their importance as a public health threat.⁵⁹

Puja also became extremely interested in the HIV virus which causes AIDS; however, very little information exists concerning isolating or obtaining the virus. No evidence exists of the group obtaining HIV from any other source so the assumption is that they isolated the virus naturally from a human carrier if at all.⁶⁰

It appears the cult came very close and had the capability to carry out larger and much more devastating bioattacks based solely on the ability to obtain deadly pathogens. The ease in acquiring agents through legal means is striking in this case. U.S. regulations have tightened since this event and once again post-9/11.⁶¹ Despite this, it demonstrates that someone with legal access to pathogens through a state-licensed medical firm or working with them in a laboratory setting has good opportunity to acquire them for future BW employment. Ability to weaponize the agent proved no different as shown below.

⁵⁸ “Salmonellosis,” Division of Bacterial and Mycotic Diseases, Department of Health and Human Services, Centers for Disease Control and Prevention, http://www.cdc.gov/ncidod/dbmd/diseaseinfo/salmonellosis_g.htm#What%20is%20salmonellosis (accessed December 2006).

⁵⁹ Miller, Engelberg, and Broad, *Germs*, 27.

⁶⁰ Carus, “The Rajneeshees,” 126.

⁶¹ Pilch, “The Bioterrorist Threat in the United States,” 220, and Leonard A. Cole, “Bioweapons, Proliferation, and the U.S. Anthrax Attack,” Conference on Terrorism, Transnational Networks and WMD Proliferation: Indications and Warning in an Era of Globalization, Naval Postgraduate School, Monterey, CA: July 25-27, 2006.

2. Weaponizing the Agent

The *S. typhimurium* samples arrived at the Rajneeshee laboratories in bactrol disks. Members extracted them from the disks to prepare multiple cultures for weaponization.⁶² The production of this agent occurred in a laboratory called the “Chinese Laundry” initially and later moved to a more discreet location called the Allan Watts complex. The lab setting was two A-frame buildings connected by a bathroom. It contained an oversized freeze dryer and an incubator the size of a small refrigerator along with other associated equipment.⁶³ These secret laboratories cultivated significant amounts of the salmonella for use in later terrorist operations. This was not only confirmed by interviews of some of the people involved, but Oregon State and FBI investigators obtained open containers of the same salmonella strain used in the attacks from those laboratories during ensuing investigations.⁶⁴

Puja relied upon the expertise of Parambodhi, a laboratory technician, to culture the salmonella in larger quantities. The technician manufactured it in liquid form that later could be spread with droppers or syringes on objects such as door handles and in food containers.⁶⁵ It was a rudimentary method to produce a weapon yet its simplicity made overcoming the weaponization obstacle possible.

The cult undoubtedly obtained the necessary laboratory equipment and pulled the technical expertise from an ordinary laboratory technician for suitable production of a biological weapon. The liquid was easily and presumably safely transported in glass jars or vials for storage and eventual dissemination (no reports of cult members becoming ill during weaponization exist). Although no estimates were made on the cost to weaponize this material, it probably was minimal with the cult’s clinics, laboratory, and RMC paying for items that were already necessary in those hospital settings.

With respect to the HIV virus, the cult purchased a quick-freeze dryer in September of 1984 because her technicians informed her that they lacked the equipment

⁶² Miller, Engelberg, and Broad, *Germs*, 29.

⁶³ Carus, “The Rajneeshees,” 127-128.

⁶⁴ Thomas J. Török et al, “A Large Community Outbreak of Salmonellosis Caused by Intentional Contamination of Restaurant Salad Bars,” in *Biological Weapons: Limiting the Threat*, ed. Joshua Lederberg, BCSIA Studies in International Security (Cambridge, MA: MIT Press, 1999), 179.

⁶⁵ Carus, “The Rajneeshees,” 128.

necessary to culture the virus.⁶⁶ They obtained the necessary equipment, and Puja had the intent to work with the virus; however, the lack of further testing and moving forward with only *S. typhimurium* suggests capability did not exist to weaponize such a virus.

Puja and her team displayed capability in obtaining salmonella and other even more dangerous pathogens and then exhibited the ability to weaponize as well. While no evidence exists that other similar agents were cultured (such as *S. typhi* causing typhoid), the cult maintained the fundamental capability to produce significant amounts of bacteria similar to *S. typhimurium*. Based on the abilities of obtaining and now producing dangerous pathogens, the cult held a dangerous capability for bioterrorism up to this point in the process.

Compounding this capability is the ease in producing the weapon and the apparent availability of the equipment necessary to produce it. Someone with the education and experience of a medical technician produced the weapon for Puja. The literature does not indicate any extraneous equipment being purchased to augment the standard equipment available to a state-licensed medical laboratory. The two characteristics perhaps elevate the concern about capability displayed in this case and may affect the level of threat assessed.

3. Employing the Biological Weapon

The cult's Salmonella attack operations fell into two phases. In the first phase, a year prior to the large-scale attacks, the cult allegedly poisoned two members of the county commission, Judge William Hulse and Ray Matthew, with an unknown agent in their drinking water that was believed to be *S. typhimurium*. The event made both individuals severely ill with salmonellosis-type effects, forcing one to be hospitalized with nearly fatal effects.⁶⁷ This appears to be a test run to determine the effectiveness and/or virulence of the weapon.

Prior to the two waves of the second phase, several members of the cult affiliated with Puja assessed targets and attempted larger trials to determine if the liquid salmonella would sicken anyone else. Sometime in July or August of 1984, while selecting targets,

⁶⁶ P. Andersson, "The Rajneeshees Cult," *Chemical and Biological Warfare* (June 2001), <http://hem.passagen.se/jan.olofsson/biowarfare/history/rajneeshee.html> (accessed December 2006).

⁶⁷ Carus, "The Rajneeshees," 128.

Puja and others stopped at an Albertson's supermarket and contaminated lettuce by pouring salmonella liquid over it. Reportedly, someone put the agent on Wasco County courthouse urinal handles and doorknobs as well; however, no one reported becoming ill from any of these trials.⁶⁸

The two primary waves occurred nearly simultaneously. The first wave was September 11-18, 1984, while the second wave followed from September 19-27, 1984.⁶⁹ The data from the Center for Disease Control (CDC) determined the sickness developed from ten restaurants (most in the earlier September wave).⁷⁰ From eyewitness testimony, Rajneeshes members armed with multiple vials of salmonella employed it by discreetly pouring the solution into salad bar bowls, salad dressings bottles, and coffee creamer containers in those ten restaurants.⁷¹

The cult succeeded with tactically employing the *S. typhimurium* bioweapon as clearly shown by the outbreak of salmonellosis infecting at least 751 individuals.⁷² Of those, at least 45 were hospitalized with no known deaths.⁷³ Due to the location of the town on a major highway and a large number of restaurants to support transients, these numbers are assumed low because of the number of out-of-town travelers passing through. It is also possible many illnesses went unreported due to the lack of media coverage beyond the immediate area.

Puja chose a simple pathogen that is highly infectious because no natural immunity exists, but most contamination occurs from uncooked foods and lack of hand washing—not human to human contact. The CDC estimates over 40,000 cases are reported annually in the United States alone, and that number is probably low due to under-reporting and lack of diagnosis. It causes great nuisance and a large epidemiological response when outbreaks happen, but it will not cause large mortality

⁶⁸ Carus, "The Rajneeshes," 133-134.

⁶⁹ Ibid, 132.

⁷⁰ Török et al, "A Large Community Outbreak," 172-174.

⁷¹ Carus, "The Rajneeshes," 129.

⁷² Török et al, "A Large Community Outbreak," 172-174.

⁷³ "Bioterrorism in the 20th Century," *National Journal* 37, 2005, 1222, <http://proquest.umi.com/pqdweb?did=832083311&Fmt=7&clientID=65345&RQT=309&VName=PQD> (accessed December 2006).

rates.⁷⁴ For the cult's strategy, *S. typhimurium* was a solid choice but other pathogens may have been better. The salmonella bacterium lacks the virulence to kill most individuals unless they possess weak immune systems such as young children or the elderly. The CDC estimates that only 600 people die annually from salmonellosis. Additionally, it is not highly contagious from person to person contact. Choosing *S. typhi* like Puja originally desired most likely would have caused numerous fatalities and possibly larger total casualties.

In terms of employment of the HIV virus, information is lacking in the literature. Apparently, Puja was extremely secretive with respect to this part of her biological programs. Unconfirmed reports state that she did attempt to infect at least one individual with the virus; however, it is unknown whether that test was successful.⁷⁵ With limited information about whether or not she even weaponized the virus, it is doubtful the capability even existed. If it did, the capability was not in any form of wide dispersal. Rather, it involved an injection into a single target.

From a capability perspective, the cult effectively disseminated a crude biological weapon to cause salmonellosis. The agent can and did survive in the dissemination environment. As shown by the tens of thousands of natural occurrences of salmonellosis each year, its presence is persistent on anything uncooked after contamination. Viable protection for those disseminating the weapon existed for *S. typhimurium* as well. As long as the individuals disseminating it minimized contact with the solution, did not eat any contaminated foods, and thoroughly washed their hands after employment of the weapon, they were virtually safe from sickness. If by chance they became ill, as described earlier, the infection is usually non-life threatening to the average healthy adult.

D. CONCLUSION

1. Reasons for Program Termination

Testimony from cult members leads to the conclusion that the attack ended for two possible reasons. First, it was a test run determining the possibility of future success

⁷⁴ "Salmonellosis," Division of Bacterial and Mycotic Diseases.

⁷⁵ Carus, "The Rajneeshees," 126-127.

in making enough people sick in the actual attack. Second, the Share-A-Home program became too time-intensive to manage, requiring the leadership's full and undivided attention.⁷⁶

If it was a test run, it was a success based on the escalation in casualties over previous trials—the cult actually made the local populace ill with this attack. This success begs the question of why the cult then failed to further employ BW as a tactic. Despite this success, the cult possibly viewed their objective in the November 1984 elections to be unachievable due to smaller than desired casualties or the failure of the complementary program in the strategy—Share-A-Home. Instead of continuing on with bioterrorism in conjunction with the Share-A-Home program, the group discarded both tactics to try other forms of terrorism to achieve their goals.⁷⁷ The group made a decision to terminate the BW program to move on to other strategies. Capability did not hinder future BW success rather other reasons forced the decision for early termination of the program. If the Share-A-Home program became unmanageable due to its size and scope, a decision to focus cult leadership on it becomes a viable reason to self-impose a stop to BW development and employment.

The perception of less success than expected, due to lower casualties than desired, and whether or not the cult achieved its objective are irrelevant for this thesis. However, the possibility of perceived failure in this context becomes a capabilities-based failure to the cult because it believed itself incapable of producing enough casualties to satisfactorily affect their objective. If this is the case, it sheds insight into the relationship between capability and tactical success. Just because a group tactically employs a weapon successfully (displaying capability) does not mean they perceive it as a success. Expedited epidemiological response by the local authorities in conjunction with state and federal assistance may have been enough to counter the Rajneeshees demonstrated capability—enough to make them terminate the program on its own. This does not change the fact that the group achieved tactical success in employing a weapon or demonstrated dangerous capability. Instead, it reveals a potential area for biodefense focus.

⁷⁶ Carus, “The Rajneeshees,” 135.

⁷⁷ Ibid.

2. Capabilities Assessment

The Rajneeshees demonstrated significant capability in their biological weapons program. The group made large strides in the complex areas of obtaining pathogens, weaponizing them, and effectively employing the weapon. They obtained simpler pathogens such as salmonella as well as more dangerous ones such as typhoid. Reasons for initially using salmonella versus typhoid or some other pathogen are not fully known except to say concern existed about attribution. The Rajneeshees overcame weaponization issues with salmonella and may have been able to mirror these procedures with the other bacteria obtained. Finally, employment of the agent caused at least 751 casualties. The dissemination practices may have been rudimentary, but nonetheless, they were still effective. From an overall perspective, Puja, her BW team, and the entire cult housed a tremendous capability. That capability was not utilized to its full extent, but latent capability is capability nevertheless.

The following chapter analyzes a second successful but much more recent case of BW employment—the U.S. anthrax attacks of 2001. The explanations for success and summary of capability illustrated in the attack will build upon the findings of this chapter. When combined with the results of the failed attacks by Aum Shinrikyo in Chapter IV, a comprehensive listing of capability will be available with which to draw conclusions on the overall threat and make recommendations to U.S. biodefense policy.

III. U.S. POSTAL SYSTEM ANTHRAX ATTACK OF 2001

A. INTRODUCTION

With only one-half teaspoon of weaponized anthrax per letter, the perpetrator of the 2001 United States Postal System (USPS) anthrax attacks unleashed approximately 20 billion spores in each. Since the number of spores to infect 50 percent of the exposed population (termed ID₅₀) is estimated at 8,000 to 15,000 spores, the potential lethality of this attack was considerable. The costs of the attack were 22 known infected, 5 of which succumbed to inhalation anthrax, and a projected \$6 billion plus price tag to clean up contaminated facilities and execute the ongoing investigation. A simple dispersal technique via the mail system was not anticipated to yield such an effect prior to this attack. Although the person or persons behind the attacks are still unknown, much can be learned from these circumstances.

The focus of this chapter is threefold. First, it determines the fundamental capabilities which allowed the person or group to obtain, weaponize, and employ the agent *Bacillus anthracis*. From these established capabilities, the chapter next assesses tactical success or failure of the attacks and ascertains which capabilities directly affected the ensuing outcome. Third, it builds upon the baseline capabilities established in Chapter I about the ability necessary to perpetrate such an attack. This chapter is the second piece in a capabilities-based risk assessment of bioterrorism from non-state actors. It adds to the results from Chapter II and when combined with the findings in Chapter IV, a comprehensive list of BW capabilities is presented along with a bioterrorism threat level assessment and subsequent recommendations to thwart the risk.

The importance of this particular study lies in three key areas. First, the lack of attribution in this case stands out as a major facet of the attack. To date, the FBI has not attributed the attack to any group or person despite an extensive search. Second, it is the first attack in which a terrorist has employed a dangerous select agent. The ability of the perpetrator(s) to carry out an attack with such a hazardous agent is very unique, especially when doing it without attribution. Finally, government concern over anthrax has been with dispersal in aerosolized form over sizeable regions causing substantial

casualties. In this case, a rudimentary employment technique caused relatively few casualties; however, it exposed an estimated 10,000 people to the bacterium, caused widespread panic, and saturated local and national authorities dealing with a relatively small attack.

The group's ability to carry out such an attack with all three characteristics sheds light upon the nature of the BW threat in two ways. The most noticeable is the major decision to employ a select agent instead of a non-select agent—crossing a previously taboo line for terrorists. Next, if a group can cause major consequences without attribution, the BW risk may again be greater than expected because the United States has no deterrent against it. In essence, this highlights the positive aspect of a capabilities-based assessment. Just as in Chapter I, being aware of a group's BW ability or perhaps just knowing the general capability groups are acquiring, may prove to be indicative of the threat the government should prepare for.

The case also underscores the shortcomings of a capabilities-based assessment as well. This chapter shows that capability becomes difficult to gauge due to the dual-use nature of biological manufacturing equipment, availability of anthrax (and other select agents) in many laboratories, availability of technical expertise, and the quickly growing field of biotechnology. Judging an individual terrorist group's capability proves difficult in this case as well. However, if the government can determine overall capability within the field and generally how it is evolving, that may prove to be the preferred use of the capabilities-based assessment. This case demonstrates that BW capability evolved from previous attacks. Intent and vulnerability to attacks must be looked at to determine threat, but capability also must be reviewed because in this case it increased significantly in magnitude and possibly escalates the threat.

The chapter begins by providing background information on the attacks and specifically the type of anthrax used. It next offers theories on possible perpetrators of the incidents. In similar fashion to Chapter II, the analysis section outlines capabilities leading to tactical success in the three phases required for an effective biological weapon

attack: obtaining or isolating a pathogen, weaponizing the agent, and employing the agent. The study ends by outlining the key reasons leading to success or failure and then overall capability displayed in the attack.

B. BACKGROUND

1. Anthrax

The disease anthrax is caused by the bacterium *Bacillus anthracis*. It forms into spores that remain dormant and protected until environmental conditions allow it to become active to cause infection. The disease is passable from person to person and exists in three types: cutaneous (skin anthrax), gastrointestinal (digestive anthrax), and inhalation (lung anthrax). Cutaneous anthrax is the least serious of the three with approximately 20 percent of untreated cases becoming fatal. Gastrointestinal anthrax is more severe with 25 to 50 percent of the untreated cases being fatal. Inhalation anthrax is the most critical and accounted for all 5 deaths of the 22 known infected individuals in the 2001 USPS attacks (45 percent of those diagnosed with inhalation anthrax).⁷⁸ This type of anthrax left untreated is astonishingly fatal in over 90 percent of the cases.⁷⁹

After exposure to *B. anthracis*, symptoms appear anywhere from several days to over 40 days depending on the type, level of exposure, and the victim's overall health. Normally, people are infected by physically handling contaminated items or breathing in enough anthrax spores off of infected items.⁸⁰ In cutaneous anthrax, infection develops from direct contact with the skin (the skin does not have to be broken or cut based on the experience from this attack). Gastrointestinal anthrax arises from ingesting anthrax infected meat—a very rare occurrence. For the most critical inhalation anthrax, it requires inhaling spores one to five microns in size. This makes them large enough to escape from being filtered by the nasal passages and upper respiratory tract yet they are still small enough to lodge deep in the lungs where they become active and infectious.

⁷⁸ “Anthrax: What You Need to Know,” Department of Health and Human Services, Centers for Disease Control and Prevention, <http://www.bt.cdc.gov/agent/anthrax/needtoknow.asp> (accessed December 2006) and Daniel B. Jernigan et al, “Investigation of Bioterrorism-Related Anthrax, United States, 2001: Epidemiologic Findings,” Centers for Disease Control, *Emerging Infectious Diseases*, October 2003, <http://www.cdc.gov/ncidod/eid/vol8no10/02-0353.htm> (accessed December 2006).

⁷⁹ Leonard A. Cole, *The Anthrax Letters: A Medical Detective Story* (Washington, D.C.: John Henry Press, 2003), 8, <http://www.nap.edu/books/030908881X/html/> (accessed July 2006).

⁸⁰ “Anthrax: What You Need to Know,” Department of Health and Human Services, Centers for Disease Control and Prevention.

The ID₅₀ number of spores necessary to infect someone with anthrax is about 8,000 to 15,000 spores; however, based specifically on this attack, the minimum infectious dose is actually much lower depending on age and the victim's overall health. While the ID₅₀ number may appear large, the 2 grams of powder found in one letter contained approximately 20 billion spores.⁸¹ Even such a small amount of anthrax powder holds a devastatingly large number of spores.

The catastrophic potential of the disease caused the Centers for Disease Control and Prevention (CDC) to classify the agent as a Category A agent, meaning it poses one of the largest threats to society of known biological agents.⁸² For this reason and the survivability of anthrax in spore form, it is a prime candidate for weaponization.

B. anthracis exists in 89 known strains. The one utilized in this attack, the Ames strain, is named for the city in Iowa where it was initially isolated.⁸³ Ames is naturally existing, extremely virulent, and surprisingly resistant to vaccines. After the signing of the BTWC in the early 1970s, the United States utilized the strain to develop and test vaccines to thwart the biological weapons developed by the Soviet Union and other countries. It is a dissimilar strain from Vollum 1B which the United States used in its offensive bioweapons program in the 1950s and 1960s.⁸⁴

2. Organization, Strategy, and Personnel

Unlike the Rajneeshees case study in Chapter II, background of the group's organization, strategy, and personnel cannot be entirely described due to the case's unsolved nature. Despite this, theories abound concerning the perpetrator(s). According to the FBI website, they are looking for an adult male that may work in a laboratory and works easily with hazardous materials. The individual probably has a scientific background or at least an intense fascination with science, and he possesses a solid source

⁸¹ John G. Bartlett, M.D., "Anthrax Update," Johns Hopkins Point of Care Information Technology (POC-IT), ABX Guide, January 12, 2002, http://hopkins-abxguide.org/show_pages.cfm?content=F27_012802_content.html (accessed December 2006).

⁸² "Anthrax: What You Need to Know," Department of Health and Human Services, Centers for Disease Control and Prevention.

⁸³ Cole cites the discovery location as Texas in 1981 and that it was misnamed Ames due to an incorrect labeling of the return address on a shipping box. Cole, *The Anthrax Letters*, 199.

⁸⁴ Steve Fainaru and Joby Warrick, "Deadly Anthrax Strain Leaves a Muddy Trail," *The Washington Post*, Washington, D.C.: November 25, 2001, A1, <http://www.anthraxinvestigation.com/wp1124.html> (accessed December 2006).

for the anthrax. He holds some expertise to weaponize anthrax to include the necessary equipment to accomplish it. Finally, this person is non-confrontational, lacks personal skills, holds grudges—a loner.⁸⁵ The FBI formulated this synopsis from that of the Unabomber profile.⁸⁶ In July 2006, Adjunct Professor of Political Science at Rutgers-Newark in New Jersey, Leonard Cole, suggests that the FBI recently broadened their profile so as not to focus on such a narrow field of possible perpetrators; however, the FBI website as of September 2006 still reflects this description.⁸⁷

Barbara Hatch Rosenberg, Chair of the Federation of American Scientists' (FAS) working group on biological weapons, believes the individual to be an American scientist with access to anthrax or at least instructed to make it by an expert.⁸⁸ She falls into what some call the “Bioevangelist” camp. This faction believes an American scientist with experience in the realm of bioweapons thought the United States was failing to give the BW risk adequate attention. The attacker demonstrated bioterrorism’s potential and blamed it on a large threat—Al Qaeda.⁸⁹ The scientist brought attention to the problem, finally summoning sufficient assets to focus on the issue. Others agree with Rosenberg.

Randall Murch, former Deputy Assistant Director in Charge of Forensic Programs for all FBI labs, holds two theories on the anthrax attacks. The perpetrator could be someone from outside the United States that sent the anthrax to a local terrorist to employ. On the other hand, the terrorist may be a “homegrown” individual with the anthrax available to him due to his profession, and that person took advantage of the 9/11 timing to employ it. Murch gravitates towards his second theory which essentially aligns with Rosenberg’s views.⁹⁰ He further believes that, “you don’t need much equipment or an advanced degree to make biological weapons. You could fit all the stuff in a

⁸⁵ “Amerithrax: The Search for Anthrax,” Federal Bureau of Investigation, <http://www.fbi.gov/anthrax/searchant.htm> (accessed December 2006).

⁸⁶ Cole, *The Anthrax Letters*, 189.

⁸⁷ Cole, “Bioweapons, Proliferation, and the U.S. Anthrax Attack.”

⁸⁸ Cole, *The Anthrax Letters*, 189 and Barbara Hatch Rosenberg, “Bioterrorism; Anthrax Attacks Pushed Open an Ominous Door,” *Los Angeles Times*, Los Angeles, CA: September 22, 2002, M1, <http://libproxy.nps.navy.mil/login?url=http://proquest.umi.com.libproxy.nps.navy.mil/pqdweb?did=190196741&sid=1&Fmt=3&clientId=11969&RQT=309&VName=PQD> (accessed December 2006).

⁸⁹ Scott Shane, “Everyone Has An Anthrax Theory” *The Baltimore Sun*, Baltimore, MD: January 6, 2002, <http://www.ph.ucla.edu/epi/bioter/everyoneanthraxtheory.html> (accessed December 2006).

⁹⁰ Cole, *The Anthrax Letters*, 195-196.

garage.”⁹¹ Both he and Rosenberg agree that someone with access to anthrax in a government or affiliated civilian program retains the knowledge necessary to obtain the equipment to weaponize anthrax at a discreet location and employ it simply through the mail system. Still others lean more towards Murch’s first theory.

David Tell of the *Weekly Standard* is one of those individuals. He argues that multiple details of the letters indicate foreign involvement. Two examples include the use of all capital letters in the writing style (similar to languages like Arabic with no upper or lower cases) and that anyone familiar with anthrax would not at that time have prescribed penicillin for treatment of the disease.⁹² A more compelling argument arises from Richard Spertzel, a microbiologist who spent years at Fort Detrick, MD, where he worked on the U.S. offensive biological weapons program to include the anthrax program. In addition, he was Head of Biological Weapons Inspections from 1994 to 1998 for the United Nations Special Commission (UNSCOM) team surveying Iraq’s weapons program.⁹³

Spertzel testified to the House Committee on International Relations in December 2001 that the anthrax, especially that of the Senators Daschle and Leahy letters, could only be produced by a group affiliated with either a current or former state weapons program. He discounts any loner theory due to the complexity of the attack. Spertzel believes this because, “the Senator Daschle letter contained anthrax that was more pure and concentrated than any found in the Soviet, U.S., or Iraqi biological programs.”⁹⁴

Spertzel noted the Iraqi program did not mill dried anthrax as in the Soviet or U.S. programs. It used a one-step technique of “spray-drying” that produces the purity of anthrax found in the letters—the only known technique capable of doing so. He advocates that somehow Iraq or a former Iraqi bioweapon scientist was involved.⁹⁵

⁹¹ Cited in Cole, *The Anthrax Letters*, 197.

⁹² Cole, *The Anthrax Letters*, 191.

⁹³ Ibid, 202 and U.S. Congress, House, Testimony of Richard O. Spertzel, *Russia, Iraq, and Other Potential Sources of Anthrax, Smallpox, and Other Bioterrorist Weapons*, Hearing before the House Committee on International Relations, 107th Cong., 1st sess., 5 December 2001, 16, http://commdocs.house.gov/committees/intlrel/hfa76481.000/hfa76481_0f.htm (accessed December 2006).

⁹⁴ U.S. Congress, House, Testimony of Richard O. Spertzel, *Russia, Iraq, and Other Potential Sources of Anthrax*, 18.

⁹⁵ Cole, *The Anthrax Letters*, 201.

Spertzel told the *Washington Post* in late 2002 that he was one of only four to five individuals in the United States that could produce anthrax to the purity found in the senate letters, and he may need a year to manufacture it in a suitable laboratory setting.⁹⁶

Kenneth Alibek, former First Deputy Chief of the Civilian Branch of the Soviet Offensive Biological Weapons Program, takes a mixed perspective. Having actually seen pictures of the anthrax, he stated in congressional testimony, "this agent and this product cannot be considered as a Russian or an American weapon."⁹⁷ He added that the perpetrator learned throughout the process because earlier batches were crude while later letters to Senators Daschle and Leahy contained much purer spores. For these reasons, Alibek characterizes the terrorists as less than highly trained professionals; however, they were affiliated in some way to the biosciences. The task necessitated some knowledge concerning the technology and production of anthrax to accomplish it.⁹⁸

Christos Tsonas, an emergency room physician at Holy Cross Hospital in Fort Lauderdale, FL, thinks he treated one of the 9/11 hijackers, Ahmed Ibrahim A. Haznawi, for cutaneous anthrax. In June 2001, Haznawi presented himself at the emergency room for a large lesion on his leg. Tsonas now believes that what he unknowingly treated with antibiotics was the skin form of anthrax. A follow-up investigation by a group at the Johns Hopkins Center for Civilian Biodefense Strategies agrees with his assessment.⁹⁹ The FBI discounts the report because the type of lesion the hijacker had on his leg will never be known. If the doctor's information is accurate, it ties the 9/11 hijackers to the attacks causing the threat to then be considerable.

⁹⁶ Guy Gugliotta and Gary Matsumoto, "FBI's Theory On Anthrax Is Doubted; Attacks Not Likely Work of 1 Person, Experts Say," *The Washington Post*, Washington, D.C.: October 28, 2002, A1, <http://libproxy.nps.navy.mil/login?url=http://proquest.umi.com.libproxy.nps.navy.mil/pqdweb?did=224293231&sid=4&Fmt=3&clientId=11969&RQT=309&VName=PQD> (accessed December 2006).

⁹⁷ U.S. Congress, House, Testimony of Kenneth Alibek, *Russia, Iraq, and Other Potential Sources of Anthrax, Smallpox, and Other Bioterrorist Weapons*, Hearing before the House Committee on International Relations, 107th Cong., 1st sess., 5 December 2001, 22, http://commdocs.house.gov/committees/intlrel/hfa76481.000/hfa76481_0f.htm (accessed December 2006).

⁹⁸ U.S. Congress, House, Testimony of Kenneth Alibek, *Russia, Iraq, and Other Potential Sources of Anthrax*, 24.

⁹⁹ William J. Broad and David Johnston, "Report Linking Anthrax and Hijackers Is Investigated," *New York Times*, New York, NY: March 23, 2002, <http://www.ph.ucla.edu/epi/bioter/anthraxhijackerslink.html> (accessed December 2006).

While these theories speculate on organization, strategy, and who the perpetrators may be, the large disparity in opinions illustrates that many experts believe the potential capability lies within numerous groups of varying backgrounds. The question is how much capability does this person or group really hold with respect to obtaining, weaponizing, and employing anthrax?

C. ANALYSIS

Describing the methodology used by the perpetrator(s) to obtain the pathogen and to weaponize it is a complex issue. Again, it is clouded by the lack of background in the case due to its unsolved nature. Despite this, it is still worth analyzing both the methodologies because in the end, they illustrate capability to obtain anthrax and weaponize it to some degree.

1. Obtaining the Pathogen

By far, the largest user and distributor of the Ames strain was the United States Army Medical Research Institute of Infectious Diseases (USAMRIID) at Fort Detrick, MD. It shared Ames in its pure, virulent form with the Chemical Defense Establishment at Porton Down in England (USAMRIID's British equivalent). It was passed to many other organizations, sometimes in its virulent form and other times genetically altered rendering the agent useless for weaponization. The same group that supplied various cultures to the Rajneeshee cult in Chapter II, ATCC, provided anthrax strains to many places, including Iraq, in the late 1980s. None of the known anthrax specimens sent to Iraq were labeled as the Ames strain. Despite this, due to imprecise labeling procedures during those times, some believe the virulent form of Ames was sent unknowingly to several less than desired locations to include Iraq.¹⁰⁰

Over the years, many pathogens, to include this strain of anthrax, were shipped unquestioningly to a vast number of unidentified locations. The availability of Ames worldwide is significant. As described in Chapter I, the WFCC believes nearly 1,000 germ banks to have improper security, and the Department of Health and Human Services reported in 2004 that severe lapses in control procedures for select agents existed at all 11 U.S. universities studied. With the right contacts or placement in an organization affiliated with biosciences and technology, the capacity to gain access to

¹⁰⁰ Fainaru and Warrick, "Deadly Anthrax Strain Leaves a Muddy Trail."

Ames or other dangerous pathogens is not beyond imagination. An example of this eerily played out around the same timeframe as the U.S. anthrax attack.

A microbiologist named Abdur Rauf worked for Al Qaeda in the late 1990s and into the new millennium. In 1999, he reported in a hand-written note to Al Qaeda's deputy commander, Ayman al-Zawahiri, that he was able to effectively accomplish his goals. In previous notes, he admitted to having setbacks acquiring *B. anthracis* in a virulent form and obtaining the necessary equipment but later reported unspecified success in achieving both goals. Other notes comprised diagrams of makeshift laboratories and testing facilities, and another described a trip as a guest into a high-level biological containment lab where thousands of pathogens were stored.¹⁰¹ This thesis is not advocating that Al Qaeda committed the USPS anthrax attacks in 2001; however, this information clearly shows motivation and intent to obtain anthrax and the necessary equipment to weaponize it. More importantly for this thesis, if the notes are true, it depicts capability or at least a heavy pursuit of that capability.

The individual actually obtaining the anthrax for the U.S. attacks may be a homegrown scientist, someone who received help from a U.S. scientist, or someone from overseas obtaining the agent or helping with it. The identity of the individual actually obtaining the anthrax does not matter from a capabilities standpoint. It is more important to acknowledge the potential of a terrorist to obtain a dangerous pathogen due to his or her personal access or contacts.

2. Weaponizing the Agent

According to Alibek, the anthrax was not from a former U.S. or Soviet offensive program partly seen by the manufacturing process. Besides those programs using other strains, they also utilized the dry-milling process to grind the spores into a very fine powder that enhances dispersal.¹⁰² While Alibek alludes to the anthrax not being produced via the dry-milling method, his congressional testimony failed to provide an alternative theory. In contrast, Spertzel provided a theory that the anthrax was produced

¹⁰¹ Joby Warrick, "Suspect and A Setback In Al-Qaeda Anthrax Case," *Washington Post*, Washington, D.C.: October 31, 2006, A1, <http://www.washingtonpost.com/wp-dyn/content/article/2006/10/30/AR2006103001250.html?referrer=emailarticle> (accessed December 2006).

¹⁰² Carus, *Bioterrorism and Biocrimes*, 17.

by the one-step process of dry-spraying because of its quality, something he believed Iraq was capable of accomplishing based on his weapons inspections in the early 1990s.¹⁰³

Adding to the debate on how the agent was manufactured, experts disagree on the quality of the anthrax in the last two recovered letters. The quality of the anthrax in these letters was significantly better than that found in the first two; however, conflicting reports have appeared from different government groups.¹⁰⁴ Alibek says the anthrax is not from a state-run weapons program due to the particle size inconsistencies; however, he does not discount that it is of decent quality.¹⁰⁵ Others such as Spertzel, think it is of phenomenal purity. David Franz, former head of the Army's biodefense lab, believes it to be of a very concentrated, pure form with "no garbage" after seeing pictures of the anthrax spores. He bases his characterization on the lack of spore coating to remove static electric charges—weapons-grade anthrax (meaning anthrax from state-sponsored programs) would be treated in this manner to increase floating and dispersal attributes.¹⁰⁶ In late September 2006, the FBI officially confirmed Franz's theory that the powder did not have anything added to increase lethality. It did not, however, downgrade the purity of the powder. Instead, the FBI only clarified it was not weaponized to a state weapons program standard with anti-static additives.¹⁰⁷

Unlike the dispute over purity and manufacturing method, expert consensus officially states the anthrax was manufactured in the two years prior to the attack. This indicates the perpetrator recently had ties to an ample laboratory setting sufficient to produce a decent grade of anthrax. This finding refutes any idea that it was appropriated

¹⁰³ Cole, *The Anthrax Letters*, 201.

¹⁰⁴ Jason Pate and Gary Ackerman, "Issue Brief: Assessing the Threat of Mass-Casualty Bioterrorism," Nuclear Threat Initiative (NTI), Center for Nonproliferation Studies, Monterey Institute of International Studies, March 2003, http://www.nti.org/e_research/e3_1a.html (accessed December 2006).

¹⁰⁵ U.S. Congress, House, Testimony of Kenneth Alibek, *Russia, Iraq, and Other Potential Sources of Anthrax*, 22.

¹⁰⁶ "Profile: Progress in Anthrax Investigation One Year After Attacks." *Morning Edition*, National Public Radio Transcript, Washington, D.C.: October 4, 2002, 1, <http://libproxy.nps.navy.mil/login?url=http://proquest.umi.com.libproxy.nps.navy.mil/pqdweb?did=352191121&sid=7&Fmt=3&clientId=11969&RQT=309&VName=PQD> (accessed December 2006).

¹⁰⁷ Allan Lengel and Joby Warrick, "FBI Is Casting A Wider Net in Anthrax Attacks," *Washington Post*, Washington, D.C.: September 25, 2006, A1, <http://www.washingtonpost.com/wp-dyn/content/article/2006/09/24/AR2006092401014.html?referrer=emailarticle> (accessed December 2006).

from a lab sample from long ago. Perhaps more strikingly, the discovery suggests that if the perpetrator was able to recently produce anthrax, a very real threat still remains today.¹⁰⁸

Although the attacker is unknown in this situation, one can assume several barriers previously thought insurmountable were overcome based upon the actual ability to weaponize the anthrax. Producing the agent in whatever manner must be relatively economical. If a large transnational terrorist group like Al Qaeda was involved, they may have had more monetary assets to facilitate such an attack. Despite this, estimates put the cost to conduct the attack at anywhere from a few thousand to \$50 thousand.¹⁰⁹ Even at the higher end of the estimate, that cost is relatively low to organize and execute a terrorist attack. In comparison, the 9/11 attacks created much greater devastation; however, they also cost nearly ten times the max estimate for the anthrax attacks at approximately \$500 thousand.¹¹⁰

Safety of those producing the anthrax and obtaining the necessary equipment are the other barriers thought too difficult to overcome. While it is not known if the perpetrator(s) survived the employment phase of the attack, they at least stayed alive throughout the weaponization process long enough to employ it over a nearly two week timeframe. Appropriating the essential safety equipment must have been simple enough to avoid detection by others and especially the authorities—most likely because of the equipment’s dual-use nature in laboratories. Similarly, the ability to acquire the production equipment explains one of two scenarios. First, the production method only requires simple and commonplace items that can be found in any laboratory making obtaining them easy. Or, the required apparatus is very technical yet still obtainable from labs lacking appropriate security and accountability procedures. In either scenario, the ability to acquire such equipment and manufacture it in a unique manner displays increased capability and relative ease in acquiring the capability.

¹⁰⁸ David Johnston and William J. Broad, “Anthrax in Mail Was Newly Made, Investigators Say,” *New York Times*, New York, NY: June 23, 2002, <http://www.ph.ucla.edu/epi/bioter/anthraxnewlymade.html> (accessed December 2006).

¹⁰⁹ Cole, “Bioweapons, Proliferation, and the U.S. Anthrax Attack.”

¹¹⁰ *The 9/11 Commission Report*, Final Report of the National Commission On Terrorist Attacks Upon the United States (New York: W.W. Norton and Company), 172.

In similar fashion to the debates over how the agent was obtained, BW experts continue to deliberate the quality or purity of the anthrax spores and its method of production. Despite these unknowns, the evidence available provides valuable insight to capability. First, a terrorist undoubtedly weaponized anthrax for dispersal; therefore, capability existed to some degree. Second, the deliberation over purity and production implies either an ability exists to manufacture anthrax in ways unproven by the former U.S. and Soviet programs (such as the dry-spraying technique) or in completely new and unknown manner altogether. A truly unique method to produce the anthrax may have been utilized. Third, the fact that it was created sometime in the two years before the attacks indicates the capability was recently obtained, but more importantly, it probably still exists due to lack of attribution. Finally, the probable ease in gaining the safety and production equipment possibly increases the threat beyond just the simple fact that someone actually obtained anthrax in the first place.

3. Employing the Biological Weapon

Before analyzing the BW employment in this case, initially reviewing the vast consequences of the attack speaks volumes towards success—tactically employing the weapon against a target regardless of outcome. The attacks exposed approximately 10,000 people to the anthrax spores as ultimately determined by the CDC.¹¹¹ Between October 2 and November 20, 2001, the CDC identified 22 cases of anthrax from those exposed. Eleven cases were inhalational anthrax and the remaining cases were identified as cutaneous anthrax. All 5 deaths occurred from the group of 11 inhalational anthrax patients.¹¹²

The exposure of 10,000 people to anthrax spores dictated the use of strong antibiotics on those individuals; the CDC identified them for a strict 60-day regimen. Estimates put an additional 20,000 people using a variety of antibiotics as a precautionary measure.¹¹³ The widespread fear and panic caused by the government and especially the media being targeted brought about the over-use of these drugs. While most terrorist

¹¹¹ “Anthrax in America: A Chronology and Analysis of the Fall 2001 Attacks,” Center for Counterproliferation Research, National Defense University, Washington, D.C.: November 2002, 7, http://www.ndu.edu/centercounter/prolif_publications.htm (accessed December 2006).

¹¹² Jernigan et al, “Investigation of Bioterrorism-Related Anthrax, United States, 2001: Epidemiologic Findings.”

¹¹³ “Anthrax in America,” Center for Counterproliferation Research, 7.

attacks happen instantaneously, this attack lasted for over a month and made people everywhere uneasy about opening their mail for a long time thereafter.

The economic impact of the anthrax attacks is extremely large and will probably never be fully accounted for due to the complexity of the situation. A General Accounting Office (GAO) report states that the Environmental Protection Agency (EPA) confirmed over 60 locations were contaminated with anthrax.¹¹⁴ The FBI and laboratory testing centers have spent untold millions on the investigation alone. Cole estimates the total expenditure to be in excess of \$6 billion dollars to decontaminate facilities and conduct the investigation to date.¹¹⁵

Approximately 2,000 CDC employees worked full-time on the case and nearly all of their 8,500 employees contributed in some way.¹¹⁶ Tasking nearly one quarter of the agency's employees to work this terrorist attack inevitably impacted other programs with which those workers were associated. The monetary cost of antibiotics for those exposed, while probably quite large, is dwarfed next to the amount spent by the thousands estimated to have unnecessarily obtained and taken antibiotics during the attack timeframe. The overall economic impact of the attacks is astonishing—estimates put the economic losses at an additional \$1 billion.¹¹⁷

Hoaxes became another facet of the economic impact of the attacks. In just the first two months following the initial attack, the FBI responded to thousands of suspicious letters. The number of man-hours spent tracking hoaxes instead of working the actual investigation (or others) had to enormously impact operations.¹¹⁸ The cost of

¹¹⁴ "Bioterrorism: Public Health Response to Anthrax Incidents of 2001," Report to the Honorable Bill Frist, Majority Leader, U.S. Senate, United States General Accounting Office, Washington, D.C.: October 2003, 9, <http://www.gao.gov/new.items/d04152.pdf> (accessed December 2006).

¹¹⁵ Cole, "Bioweapons, Proliferation, and the U.S. Anthrax Attack."

¹¹⁶ Cole, *The Anthrax Letters*, 133.

¹¹⁷ David Ruppe, "Threat-Mongering?" *National Journal*, Washington, D.C.: April 23, 2005, Vol. 37, Iss. 17, 1218, <http://proquest.umi.com.libproxy.nps.navy.mil/pqdweb?index=126&did=832083281&SrchMode=1&sid=3&Fmt=4&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1158551714&clientId=11969> (accessed December 2006).

¹¹⁸ Estimates put the number of hoaxes anywhere from 1,000 to 7,000 during the first eight weeks following the initial attack. Cole, *The Anthrax Letters*, 180.

the FBI and other organizations tracking hoaxes combined with those individuals being pulled away from the actual investigation is staggering.

The perpetrator(s) unquestioningly obtained and in some way weaponized the anthrax. They inflicted devastating consequences upon the entire nation from sickness, to death, to large economic losses, to large government clean-up expenses, and finally to marring the American psyche. How did the terrorists achieve these widespread “weapon of mass effect” types of results?

Although the FBI only recovered four letters during the ensuing investigation, experts hypothesize that seven letters were probably sent laden with anthrax to various locations. On September 18, 2001, almost certainly the initial five letters were sent from a mailbox in Trenton, NJ. Subsequently on October 9, 2001, the terrorists sent the final two anthrax letters from the same mailbox location.¹¹⁹ Figure 1 depicts the trail of letters from mailbox to their final destinations.

¹¹⁹ “American Anthrax Outbreak of 2001,” UCLA Department of Epidemiology, School of Public Health, http://www.ph.ucla.edu/epi/bioter/detect/antdetect_intro.html (accessed December 2006).

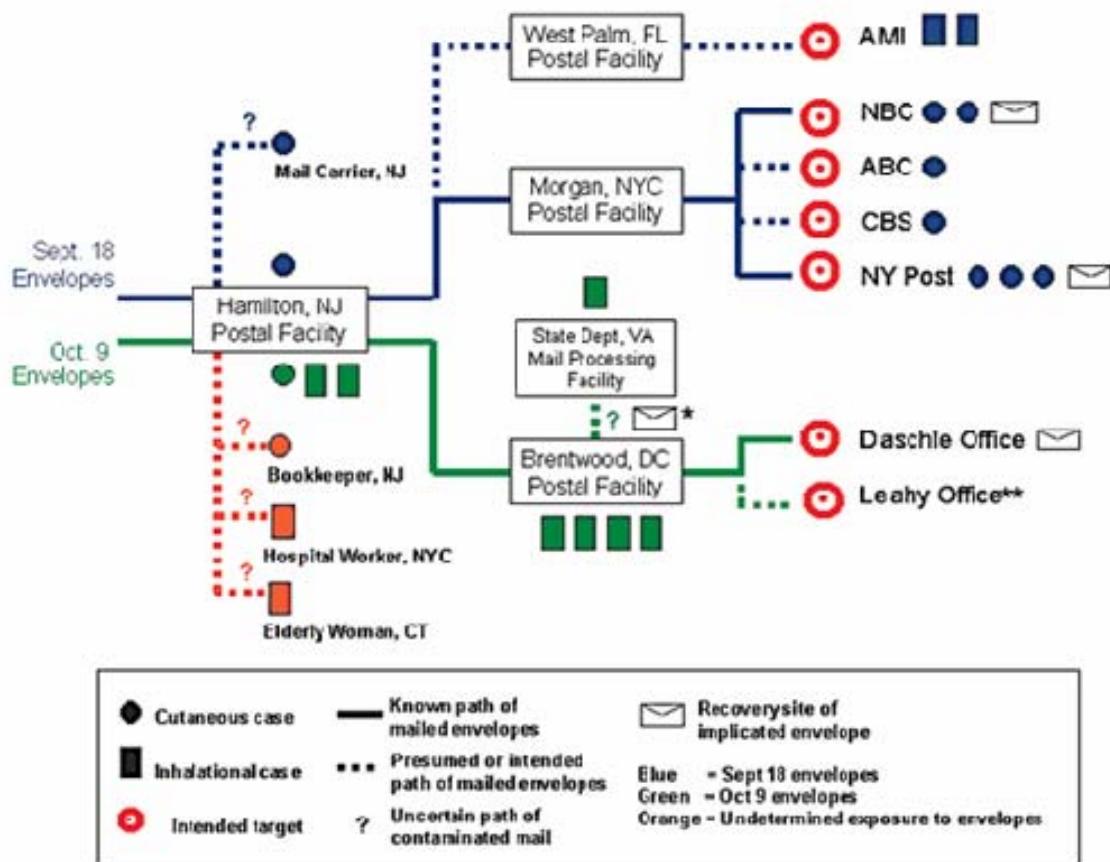


Figure 2. Cases of Anthrax with Paths of Envelopes and Intended Target Sites.

NY, New York; NBC, National Broadcasting Company; AMI, American Media Inc.; USPS, United States Postal Service; CBS, Columbia Broadcasting System. *Envelope addressed to Senator Leahy, found unopened on November 16, 2001, in a barrel of unopened mail sent to Capitol Hill; **dotted line indicates intended path of envelope addressed to Senator Leahy.¹²⁰

All recovered letters are indisputably from the identical source.¹²¹ Although a group may have perpetrated the attack, the letters were all prepared by a single writer as determined by the same writing style and similar messages within the letters. An FBI

¹²⁰ Reprinted from Jernigan et al, "Investigation of Bioterrorism-Related Anthrax, United States, 2001: Epidemiologic Findings."

¹²¹ "American Anthrax Outbreak of 2001," UCLA Department of Epidemiology.

linguistic assessment confirms with nearly 100 percent certainty that they were produced by the same individual.¹²²

Each letter contained roughly two grams or one-half teaspoon of dry powder anthrax based on those actually recovered.¹²³ The letters exposed people and contaminated facilities through two methods. The primary method dispersed anthrax spores when the letters were opened. The actions of tearing open the envelopes and possibly removing the contents agitated the powder allowing it spill and become airborne. All victims developed symptoms of either inhalation or cutaneous anthrax so the spores either settled onto their skin or were inhaled in large enough amounts to cause infection. This is a rudimentary employment tactic that would normally not make many sick; however, since the CDC identified over 10,000 people for exposure, in theory, it had the potential of still making sizeable numbers ill if not recognized fairly quickly by the public health system.

Just weeks before the actual attacks, a study published results of testing concerning envelope contamination with anthrax. The study used *Bacillus globigii* spores (a similar but non-virulent form of *B. anthracis*) to test the dissemination characteristics of aerosolized anthrax when a contaminated letter is opened. The results of the study staggered experts. With an envelope containing only 0.1 grams of dried anthrax, the individual opening a letter could inhale nearly 500 times the LD₅₀ amount of spores within 10 minutes. The subsequent aerosol spread so rapidly that others within a room would also inhale lethal doses.¹²⁴

The secondary method of dispersal was unanticipated by most experts and probably caused unintended and/or unforeseen contamination in the attack. Direct contamination and subsequent cross-contamination caused substantial damage via the

¹²² Linguistic/Behavioral Analysis of Anthrax Letters, Critical Incident Response Group, National Center for the Analysis of Violent Crime, Amerithrax Press Briefing: November 9, 2001. <http://www.fbi.gov/anthrax/amerithrax.htm> (accessed December 2006).

¹²³ “American Anthrax Outbreak of 2001,” UCLA Department of Epidemiology, and Bartlett, “Anthrax Update.”

¹²⁴ B. Kournikakis, S. J. Armour, C.A. Boulet, M. Spence, and B. Parsons, “Risk Assessment of Anthrax Threat Letters,” Defence Research Establishment Suffield, Technical Report DRES TR-2001-048, September 2001, <http://ehs.ucdavis.edu/ucbso/ReferenceDoc/RiskAssessmentofAnthrax.pdf#search=%22Risk%20Assessment%20of%20Anthrax%20Threat%20Letters%22> (accessed December 2006).

postal sorting process. The mail system proved to be more efficient and lethal than formerly believed in spreading an agent such as anthrax and compounding its effects.

The *B. globigii* postal study reported that if envelopes carrying the anthrax spores were not perfectly sealed, those working in the mail systems became exposed due to the compression of mail through the processing machines.¹²⁵ Even more striking was research about spores seeping through microscopic envelope pores. Another study found that thousands of pores exist in envelopes allowing one to five micron diameter particles to pass through its walls. The analysis further suggested that compression from mail processing equipment would increase the flow of spores out of an envelope through these pores.¹²⁶ This crude dissemination technique sickened and killed postal workers, contaminated dozens of postal facilities, and cross-contaminated other pieces of mail causing people to contract anthrax whose mail flowed through the sorting equipment at similar times as the terrorist letters. The attack demonstrates the fundamental capability present when a group obtains and weaponizes a pathogen. Even crude or rudimentary techniques can cause mass effects. Military-style dissemination techniques utilizing aerosolized anthrax are not required to greatly affect an area.

D. CONCLUSION

The perpetrator(s) tactically succeeded in obtaining, weaponizing, and employing anthrax. Terrorists in this case displayed noteworthy capability in their biological weapons program in all three areas. Although the specific details are unknown about how they obtained or weaponized the anthrax, the group made great strides just from the plain fact they obtained and weaponized a select agent. Previously, this has not been knowingly accomplished by any person or group. The terrorists employed the weapon in a very crude manner but yielded widespread effects with great impact on many aspects of society. Did this signify success in the eye of the perpetrator(s)? It will only be known when the FBI attributes the harm done to someone. What matters and what can be said is that capability existed in all three areas to complete a BW attack with a very dangerous

¹²⁵ Kournikakis, et al., "Risk Assessment of Anthrax Threat Letters."

¹²⁶ Earl Lane, "A Solution For Anthrax Mystery. Study: Spores Seep Through Paper," *Newsday*, November 30, 2001, <http://www.ph.ucla.edu/epi/bioter/asolutionanthraxmys.html> (accessed December 2006).

agent. Noteworthy as well is the apparent ease of gaining the pathogen and necessary equipment to manufacture the germ without attribution.

In contrast to Chapters II and III, the following chapter analyzes a less successful attempt at BW employment by the Aum Shinrikyo cult. The explanations for failure and summary of capability illustrated in the attack will build upon the findings of this and the previous chapter. With all three chapter findings combined, a comprehensive listing of capability will be available with which to draw conclusions on the overall threat and make recommendations to U.S. biodefense policy.

IV. THE AUM SHINRIKYO CULT

A. INTRODUCTION

On March 20, 1995, the Aum Shinrikyo cult unleashed a crude Sarin attack upon the Tokyo subway station leaving 12 people dead and thousands hospitalized.¹²⁷ The group is infamous for this landmark terrorist attack. Less known about the cult is their fascination with and heavy investment in biological weapons. Chemical warfare agents such as Sarin were actually a secondary weapon of choice to bring about its destructive goals. Biological warfare agents were the group's first choice until they delivered less success than anticipated.

This chapter examines three issues. First, it answers how the group obtained, weaponized, and employed the BW agents *Bacillus anthrax* and *Clostridium botulinum*. Next, the chapter assesses the tactical performance of the attacks and ascertains which of the established capabilities directly affected the outcome. Finally, it builds upon the findings in the previous two chapters helping to consolidate a list of basic capabilities necessary to conduct a BW attack. This chapter is the final component of the capabilities-based risk assessment of bioterrorism by non-state actors. When the findings of all three case studies are synthesized in Chapter V, an extensive list of current BW capabilities is presented as well as a bioterrorism threat assessment and proposed changes to biodefense policy to hinder that threat.

The fundamental importance of this case study is in its outcome. It is the one case that is more failure than success in the use of BW. Despite this, the case still demonstrates that a large BW capability existed within the cult. Although failure may occur, capability issues may not be the paramount obstacle to overcome. A group's abilities may still be significant with other explanations causing failure.

As was observed in the previous two chapters, this case underscores the weakness in a capabilities-only risk assessment. Primarily, it shows the difficulty to assess a group's capability due to the dual-use nature of biological manufacturing equipment and

¹²⁷ Kyle B. Olson, "Aum Shinrikyo: Once and Future Threat?" Center for Disease Control and Prevention, *Emerging Infectious Disease*, vol. 5, no. 4 (July-August 1999), 513-514, <http://www.cdc.gov/ncidod/EID/vol5no4/pdf/olson.pdf> (accessed December 2006).

non-select agents, widespread technical expertise availability, and the quickly growing field of biotechnology and science. The chapter may provide even more support to utilize a capabilities-based risk assessment from a broad perspective—judging overall capability possible by groups today in the three areas of BW development—rather than specifically against each and every terrorist group. Finally, the study emphasizes that because capability is so vital in determining the threat, it is imperative for authorities to be able to determine it in the future. This group displayed significant capability that may have been utilized in more devastating ways had the circumstances been different.

To begin the study, the chapter develops the background of the Aum Shinrikyo cult. It reviews how the group chose to implement a WMD program and then introduces key personnel. The study next analyzes capabilities leading to the outcomes within the three phases necessary for a biological terrorism attack: obtaining or isolating a pathogen, weaponizing the agent, and employing it. The chapter ends by reviewing reasons for the cult’s termination of its BW program, and it provides a summary of capability presented by the case.

B. BACKGROUND

1. Organization

A psychopath named Chizuo Matsumoto founded the Aum Shinrikyo cult. Born in 1955 on the Japanese island of Kyushu, he was the fourth son of a poor family of mat weavers.¹²⁸ He was afflicted with infantile glaucoma causing blindness in one eye and partial blindness in the other. After being sent to a boarding school for the blind, Matsumoto took advantage of his partial sight to adversely influence the other fully blind students. He exhibited aggressive and ambitious behavior very early on in life.¹²⁹ By the

¹²⁸ Rex A. Hudson and the Federal Research Division of the Library of Congress, *Who Becomes a Terrorist and Why: The 1999 Government Report on Profiling Terrorists* (Guilford, CT: Lyons Press, 2002), 193.

¹²⁹ David E. Kaplan, “Aum Shinrikyo (1995),” in *Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons*, ed. Jonathan B. Tucker, BCSIA Studies in International Security (Cambridge, MA: MIT Press, 2000), 208-209.

time he graduated from high school in 1975, he defrauded his classmates of approximately \$3,000 and gained their respect but only through the use of fear.¹³⁰

Throughout his childhood and into young adulthood, Matsumoto desired to be a leader, but his school peers and society bypassed him nearly every time. He ran for student-body president occasionally from his elementary to high school years but failed each time to be elected. Matsumoto aspired to be the prime minister of Japan after finishing high school so he sought to attend Tokyo University, the school for Japan's privileged. He failed the entrance exams and once again stymied his quest for leadership. Soon after this devastating failure he returned to Tokyo, Japan where he met his wife and quickly had their first of six children. At this point Matsumoto began his journey towards leader of Aum Shinrikyo.¹³¹

A religious void existed in Japan during the 1970s. It stemmed from the dismantlement of State Shinto (government lead by a divine emperor) by the United States at the end of the Second World War. Hundreds of new religions popped up to fill the hole during Japan's economic boom in the 1970s. While finally becoming a successful businessman earning significant money in the areas of yoga, acupuncture and the selling of fake herbal cures, Matsumoto became increasingly dissatisfied with his life and its purpose. He also began searching for religion to help fill this emptiness.¹³² In 1981, he joined a new religion called Agonshu.¹³³ Despite its teachings, he became even more dissatisfied than before he joined. In 1984, he broke away from Agonshu and formed a new company called Aum, Inc—a yoga school that marketed fake health drinks. He had not gained a spiritual awakening from his Agonshu experience, but Matsumoto now had a model of how to form his own cult and if nothing else capitalize monetarily

¹³⁰ Listed as \$30,000 by Kaplan and Marshall. David E. Kaplan and Andrew Marshall, *The Cult at the End of the World: The Terrifying Story of the Aum Doomsday Cult, from the Subways of Tokyo to the Nuclear Arsenals of Russia*, (New York: Crown Publishers, 1996). Either amount quite significant for that period. Hudson, *Who Becomes a Terrorist and Why*, 193.

¹³¹ Kaplan and Marshall, *The Cult at the End of the World*, 8-9.

¹³² Ibid, 9-10.

¹³³ Hudson, *Who Becomes a Terrorist and Why*, 194.

from that idea.¹³⁴ By the mid-1980s, he recruited nearly 3,000 followers into the yoga school.¹³⁵ He used his profits to expand the institution across Japan enabling him to bring in even more money.

In 1985, Matsumoto officially changed his name to Shoko Asahara. This identity change and self-perceived spiritual awakening evolved after two major events in his life: receiving a message from God while meditating on a beach and meeting a fanatical historian later that same year. The message from God told him that he was chosen to lead God's army. Not knowing the full meaning of what God meant in his message at the time, the historian put the entire revelation into clear context. He informed Asahara that Armageddon would arrive by the end of the millennium, only a godly group will survive it, and the leader of that group will emerge as the leader of Japan. Based on this self-perceived divine guidance combined with the historian's "prophecy," Asahara changed his name, grew out a beard, and began to wear clothing of a religious man.¹³⁶ The change to a religious guru was almost complete. There was no doubt, at least in his mind, that this was his calling.

The pinnacle moment in his transformation to a religious leader was a meeting with the Dalai Lama in February 1987 in Dharmasala, India. Asahara claimed the Dalai Lama asked him to spread Buddhism throughout Japan since he had the mind of a Buddha. With this divine backing, Asahara believed he attained full enlightenment of his "religious powers" and set forth in working his company into a cult. In the months following this visit, he changed his yoga school from Aum, Inc. to Aum Shinrikyo and began having his followers call him *sonshi* the Japanese word for guru.¹³⁷ Asahara's company officially evolved from yoga school to religious cult with him being the leader and guru.

Asahara learned from previous experiences with Agonshu that apocalypse-type rhetoric brought in many followers to the group and therefore money. He assembled the ideas of Armageddon from western religions, the apocalyptic prophecies of Nostradamus

¹³⁴ Kaplan and Marshall, *The Cult at the End of the World*, 11.

¹³⁵ Hudson, *Who Becomes a Terrorist and Why*, 194.

¹³⁶ Kaplan and Marshall, *The Cult at the End of the World*, 11-12.

¹³⁷ Ibid, 13-15.

from the 16th century, and Lord Shiva the Destroyer from Hinduism. He capitalized financially by developing this conglomeration of doomsday material, prophecies, and cures that sold well to many cult members and others.¹³⁸ By the mid-1990s, Aum Shinrikyo held 40,000 to 60,000 constituents and monetary assets in the realm of \$1 billion.¹³⁹ It also had 20 major facilities in Japan while expanding to over 30 branches in 6 countries, to include: a trading company in Taiwan, a Sri Lankan tea company, an Australian sheep ranch, and research facilities in Yugoslavia.¹⁴⁰

2. Fundamental Issues

The real story of Asahara, Aum Shinrikyo, and bioterrorism begins in 1989 with two issues: the cult running for elections within Japan's lower parliament and the Japanese government granting the group official religious status.¹⁴¹ The results of the political bid and status as a religious corporation respectively cause and enable Asahara to take a new route towards death and Armageddon via weapons of mass destruction.

In the 1989 political campaign, 25 cult candidates to include Asahara lost miserably after spending nearly \$7 million of the group's money in bizarre campaigns. Asahara received only 1,783 of 500,000 votes in a district with 1,800 of his own cult followers.¹⁴² "Their failure, Asahara proclaimed, only confirmed how decrepit society had become and showed the need for more extreme solutions. From here on, he would abandon trying to work within the system; he was now intent on destroying it."¹⁴³ This political disgrace greatly fueled Asahara in taking a tack towards death and destruction.

¹³⁸ Kaplan and Marshall, *The Cult at the End of the World*, 15-16.

¹³⁹ Cited in other sources in the range of tens of millions of dollars of assets. The lower numbers may have been obtained after Aum Shinrikyo squandered millions on expansions and multiple WMD programs. Senate Government Affairs Permanent Subcommittee on Investigations, "Global Proliferation of Weapons of Mass Destruction: A Case Study on the Aum Shinrikyo," Staff Statement, October 31, 1995, http://www.fas.org/irp/congress/1995_rpt/aum/index.html (accessed December 2006).

¹⁴⁰ Kaplan, "Aum Shinrikyo," 209.

¹⁴¹ National Police Agency, "1996 Police White Paper," translation by Emiko Amaki and Robert Mauksch, Center for Nonproliferation Studies, Monterey, CA: Monterey Institute of International Studies, <http://cns.miis.edu/> (accessed December 2006), 6, Hudson, *Who Becomes a Terrorist and Why*, 196-197, and Senate Government Affairs Permanent Subcommittee on Investigations, "Global Proliferation of Weapons of Mass Destruction."

¹⁴² Kaplan and Marshall, *The Cult at the End of the World*, 47 and Senate Government Affairs Permanent Subcommittee on Investigations, "Global Proliferation of Weapons of Mass Destruction."

¹⁴³ Kaplan and Marshall, *The Cult at the End of the World*, 48.

Japan's 1947 Religious Corporation Law protected Asahara's warped religion; therefore, the cult made official religious recognition a top priority. The law hindered the Japanese government from investigating any type of religious doctrine or activities. This was done to avert overzealousness or any state-affiliation to a religion as was the case during the former State Shinto government.¹⁴⁴ Asahara would use this virtual free pass with the Japanese government to attempt to attain his final goal—destroy the system and bring about the Armageddon that he promised. Further, he would be ready with his cult to lead the new Japanese government and possibly the world.

Following the elections and armed with a certified government religious status, Asahara began writing and teaching of a coming Armageddon. Although not a normal theme in Buddhism, Armageddon became a major one in Aum Shinrikyo. The only way to salvation was through the cult.¹⁴⁵ In his book *Shivering Predictions by Shoko Asahara*, he stated:

From now until the year 2000, a series of violent phenomena filled with fear that are too difficult to describe will occur. Japan will turn into a waste land as a result of a nuclear weapons attack. This will occur from 1996 through January 1998. An alliance centering on the United States will attack Japan. In large cities in Japan, only one-tenth of the population will be able to survive.”¹⁴⁶

Asahara continued to preach about Armageddon with variations in dates and story; however, the general theme of death and destruction in the late 1990s to early millennium did not change. In order to facilitate his prophesized doom, he organized the cult to take control of the Japanese government when necessary, and he recruited bright individuals to facilitate the coming death and destruction through WMD programs.

According to Rex Hudson, “Cults actively weed out the stupid and the psychiatric cases and look for people who are lonely, sad, between jobs or jilted.”¹⁴⁷ Many of Asahara’s followers joined the cult to avoid or rebel against the over worked, corporate-

¹⁴⁴ Senate Government Affairs Permanent Subcommittee on Investigations, "Global Proliferation of Weapons of Mass Destruction."

¹⁴⁵ Ibid.

¹⁴⁶ Cited in Senate Government Affairs Permanent Subcommittee on Investigations, "Global Proliferation of Weapons of Mass Destruction."

¹⁴⁷ Hudson, *Who Becomes a Terrorist and Why*, 192.

centered lifestyle that caused devotion to one's job to supersede virtually everything else in Japan's culture. Aum Shinrikyo attracted Japan's elite in the fields of biology, engineering, chemistry, computers, and many other top professions.¹⁴⁸ The cult targeted universities and those in dead-end careers, and it found thousands of sharp individuals looking for something more in life. To understand the methods and goals used by Asahara and Aum Shinrikyo, a review of the key bright Japanese recruits/leaders is necessary to understand how they came to attempt bioterrorism attacks and perhaps why they were unsuccessful.

3. Personnel

Aum Shinrikyo mirrored its organizational structure to the Japanese government by establishing 24 ministries and agencies each with a devout cult member as its leader.¹⁴⁹ When Armageddon eventually happened, the cult would be ready to step in and quickly assume the lead role in Japanese government.¹⁵⁰ These ministers and agency heads formed the inner circle of Asahara's trust—aware of and major participants in Aum Shinrikyo's criminal behavior unlike the majority of the remaining organization.¹⁵¹ The key individuals to focus on with respect to bioterrorism incidents are the following:¹⁵²

- Minister of Science and Technology: Hideo Murai
- Minister of Healing: Ikuo Hayashi
- Minister of Health and Welfare: Seiichi Endo

The Minister of Science and Technology, Hideo Murai, was also considered the Minister of Distribution Supervision and the overall apocalypse engineer. He graduated from Osaka University with a degree in Physics and soon thereafter earned a masters degree in Astrophysics. Murai worked in Kobe Steel's research and development section for two years and quit his career entirely to join Aum Shinrikyo in 1989. He was directly involved in numerous violent incidents: the murder of a lawyer and his family, the murder of at least one cult member, the Matsumoto Sarin attack that killed seven and

¹⁴⁸ Hudson, *Who Becomes a Terrorist and Why*, 192-195.

¹⁴⁹ D.W. Bracket, *Holy Terror: Armageddon in Tokyo* (New York: Weatherhill, 1996), 102-105, and Kaplan, "Aum Shinrikyo," 211.

¹⁵⁰ Bracket, *Holy Terror*, 103.

¹⁵¹ Ibid, 105.

¹⁵² Hudson, *Who Becomes a Terrorist and Why*, 200.

injured nearly 150 people, and the infamous Tokyo subway Sarin attack that killed 12 and injured thousands.¹⁵³ Murai was an intelligent individual holding a very technical educational background. However, he had little work experience in his field and lacked the educational background or work experience in any field remotely related to bioagents or bioweapon development. Despite this, he was part of the group working on BW programs, and specifically one of the scientists making the decision to obtain certain pathogens.¹⁵⁴

The Minister of Healing, Ikuo Hayashi, managed the Aum Shinrikyo clinic in Tokyo. He graduated from Keio University's medical school and then studied at Mount Sinai Hospital in the United States. He served for many years at a government hospital near Tokyo specializing in heart and circulatory system conditions. Following a car accident where he nearly killed two people, Hayashi became downhearted and soon after joined Aum Shinrikyo. After joining the group, his professional methodologies for treating patients changed. "He told those under his care that their illnesses would never be cured through conventional means. Instead, he prescribed a range of treatments that included drinking quarts of hot water, swallowing string, and jumping."¹⁵⁵ Due to hospital pressure about his unorthodox treatments, Hayashi resigned and moved his family onto an Aum Shinrikyo compound.¹⁵⁶ Although Hayashi had the general medical training to be involved in a biological program, he again lacked the direct training or experience in these fields that perhaps even an uneducated technician might have that works directly with pathogens on a day-to-day basis. Even if he had the sufficient educational or work background, he was also busy working as the Minister of Healing and running the clinic. Hayashi was involved in the torture, drugging, and deaths of multiple individuals in addition to erasing the memories of 130 members via electric shock. He also helped perpetrate the Tokyo subway Sarin attack.¹⁵⁷

¹⁵³ Hudson, *Who Becomes a Terrorist and Why*, 209-210.

¹⁵⁴ Ibid, 200 and Kaplan and Marshall, *The Cult at the End of the World*, 52.

¹⁵⁵ Kaplan and Marshall, *The Cult at the End of the World*, 77-78.

¹⁵⁶ Ibid, 78.

¹⁵⁷ Hudson, *Who Becomes a Terrorist and Why*, 204.

The Minister of Health and Welfare, Seiichi Endo, was considered the top BW specialist within Aum Shinrikyo.¹⁵⁸ He was a graduate student prior to joining Aum Shinrikyo where he studied biology at Kyoto University and accomplished research/experiments in genetic engineering at the school's Viral Research Center. Endo researched and attempted to obtain and culture *Clostridium botulinum* and *Bacillus anthracis* for Aum Shinrikyo as the leader of the BW research teams.¹⁵⁹ He was perhaps the one known individual with the technical ability that when combined with the laboratory resources provided by Aum Shinrikyo could possibly have cultured and prepared virulent bioagents; however, he was not a microbiologist and had limited work experience in the field.

Asahara also assigned Endo to manufacture Sarin nerve gas which he produced in an impure form for the March 20, 1995 Tokyo subway attack. He was directly involved in perpetrating both Sarin attacks in Matsumoto and Tokyo as well.¹⁶⁰ These tasks effectively removed him from his work on biological weapons at that time.

The remaining individuals that formed the ministry and agency heads (and Asahara's inner circle) lacked the educational background and/or work experience to be of major impact in a bioweapons program. In addition to the lack of necessary background for this kind of work, the cult's mind control tactics possibly hampered the scientists' and other workers' abilities to produce better WMD of any type. Numerous sources characterize Aum Shinrikyo followers, specifically those involved in WMD, as having studied at Japan's best universities in technical degrees such as medicine, biochemistry, biology, etc.¹⁶¹ In actuality, not all members benefited from these backgrounds with many being poorly educated and working class.¹⁶² Although Aum Shinrikyo recruited many educated individuals with advanced degrees,

¹⁵⁸ Senate Government Affairs Permanent Subcommittee on Investigations, "Global Proliferation of Weapons of Mass Destruction."

¹⁵⁹ Hudson, *Who Becomes a Terrorist and Why*, 202 and Kaplan and Marshall, *The Cult at the End of the World*, 95.

¹⁶⁰ Hudson, *Who Becomes a Terrorist and Why*, 202-203.

¹⁶¹ For two examples, see Kaplan, "Aum Shinrikyo," 213 and Senate Government Affairs Permanent Subcommittee on Investigations, "Global Proliferation of Weapons of Mass Destruction."

¹⁶² Senate Government Affairs Permanent Subcommittee on Investigations, "Global Proliferation of Weapons of Mass Destruction."

they also gained numerous individuals with no technical background for BW work. Those signed up with advanced degrees were quite young and inexperienced in their fields. Most had academic experience but little work experience in their respective fields let alone any experience as a microbiologist dealing with bioagents. This contradictory view of Aum Shinrikyo's elite is important and will be addressed later when looking at reasons for failure.

The cult utilized a multitude of mind control techniques during initiation and throughout everyday life to hunt out spies, trick members into signing over their savings and properties, and keep general control of the masses. In 1986, Aum Shinrikyo started a dual-track membership system. "Ordained" members were required to donate all of their assets to include inheritances to the cult while "Lay" members were just "normal" or typical followers of the religion. Fifty-six ordained members were reported as missing, and another 21 died in the cult's clinic.¹⁶³ Compelling members to submit in every way to the group was a high priority for Aum Shinrikyo, and many paid the ultimate price for lack of capitulation after discovering the evil nature of the cult.

The group's initiation process used "mind-altering drugs" to captivate outsiders and brainwashing techniques such as continual sleep-deprivation and isolation to control individuals already part of the cult.¹⁶⁴ One former recruit reported being drugged by a hallucinogenic like LSD during initiation to be afforded a more religious experience to draw him deeper into the religion. He was then not allowed to return home but instead confined to a monastery to devote his time to meditation.¹⁶⁵ Drugs were used not only in initiations but in punishment as well. As reported by an ex-member who successfully fled the cult in 1994, many members lost their minds due to continual drug-induced states and wandered aimlessly throughout the compounds not knowing who they were let alone what they were doing.¹⁶⁶

¹⁶³ Hudson, *Who Becomes a Terrorist and Why*, 194.

¹⁶⁴ Senate Government Affairs Permanent Subcommittee on Investigations, "Global Proliferation of Weapons of Mass Destruction."

¹⁶⁵ Mark Juergensmeyer, *Terror in the Mind of God: The Global rise of Religious Violence* (Berkeley, CA: University of California Press, 2003), 109.

¹⁶⁶ Bracket, *Holy Terror*, 97.

In a pamphlet called “The Vajrayana Vow,” Asahara borrowed from a Buddhist tantra but gave it his own new meaning. He modified it to say, “followers were to empty themselves completely of their own selfhood so that they could be filled with the spirit of the guru. Their only religious practice was to do whatever the guru instructed, and the guru was always right.”¹⁶⁷ This tantra helped brainwash followers into believing murder and other atrocities were legal and justified if Asahara authorized them.

Finally, Aum Shinrikyo utilized the mind-control techniques of food and sleep deprivation to keep members under control. The exhaustive techniques made members more susceptible to Asahara’s bizarre teachings which came at them relentlessly. These tactics coupled with seclusion and the cutting of ties with family virtually guaranteed complete devotion to the cult.¹⁶⁸ All of these techniques fostered an environment that guaranteed followers did what their leaders desired and that whatever the leaders wanted was therefore acceptable.

It is worthwhile noting that Aum Shinrikyo members by-and-large were innocent of the heinous crimes and terrorist attacks. Asahara’s inner circle of agency heads and ministers not only planned the atrocities with him, but many times they personally ensured the preparations were complete and/or helped perpetrate the events. Aum Shinrikyo leaders initially believed they were building these weapons in a defensive posture to survive the ravages of Armageddon when it happened.¹⁶⁹ Asahara’s justification for the weapons unfortunately changed by the early 1990s. He believed they needed to inflict attacks on society to bring about a war between the United States and Japan. Following the 1993 attempted bioattacks, Asahara hoped to blame the U.S. government for the acts proving that his prophecy of a U.S. led attack on Japan had come true.¹⁷⁰ While the group of followers aware of the BW program was small and their intentions initially defensive, Aum Shinrikyo turned sinister when Asahara’s intentions for the weapons were combined with a tight-knit group of mind-controlled leaders and devoted followers.

¹⁶⁷ Bracket, *Holy Terror*, 96.

¹⁶⁸ Kaplan and Marshall, *The Cult at the End of the World*, 22.

¹⁶⁹ Kaplan, “Aum Shinrikyo,” 208.

¹⁷⁰ Ibid, 220.

C. ANALYSIS

1. Obtaining the Pathogens

Aum Shinrikyo's financial assets available to obtain and/or isolate pathogens were unrivaled. Additionally, the cult's clinic held official medical status which did allow them access to equipment and certain pathogens through legal means as was the case with the Rajneeshee cult. With these two characteristics, the group maintained a strong ability to obtain pathogens. Despite this, the group chose to naturally isolate *Clostridium botulinum* from the soil on the northern Japanese island of Hokkaido and illegally acquire *Bacillus anthracis* from a local hospital.¹⁷¹

The cult was destined for failure from the beginning with botulinum toxin (the toxin created from *Clostridium botulinum*). It chose to work with a difficult agent to isolate naturally if unable to gain access to the bacterium from a germ collection. Knowing this difficulty, the group still continued to pursue the pathogen despite having to naturally isolate it. According to Masaaki Sugishima of Asahi University's School of Law, Aum Shinrikyo (specifically Seiichi Endo) failed to isolate *Clostridium botulinum* from the soil.¹⁷² Endo and the group fell short from the outset by choosing a difficult route to obtain a pathogen and being unable to isolate the bacterium from which the toxin would then be created. Failure occurred due to incompetence in a complex procedure for any scientific group in the field of biology.

In contrast, Aum Shinrikyo's anthrax program took a slightly different course. Endo requested a cult member with a medical license to acquire *Bacillus anthracis* for the cult's BW program. Instead, Endo received a non-virulent vaccine form of anthrax—the

¹⁷¹ William J. Broad, "How Japan Germ Terror Alerted World," *New York Times*, New York, NY: May 26, 1998, A1, <http://proquest.umi.com.libproxy.nps.navy.mil/pqdweb?index=4&did=29683988&SrchMode=1&sid=3&Fmt=3&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1163713595&clientId=11969> (accessed December 2006), Kaplan, "Aum Shinrikyo," 215, and Milton Leitenberg, "Aum Shinrikyo's Efforts to Produce Biological Weapons: A Case Study in the Serial Propagation of Misinformation," in *The Future of Terrorism*, ed. Max Taylor and John Horgan, Cass Series on Political Violence (Portland, OR: Frank Cass, 2000), 153.

¹⁷² Cited in Milton Leitenberg, *Forum on Microbial Threats*, Presentation to the U.S. National Academy of Sciences, Institute of Medicine, October 25, 2005.

Sterne strain used in Japan to vaccinate animals.¹⁷³ Evidence suggests that Endo realized he was working with a vaccine strain leading to the possible conclusion that he was obtaining it as a test case for the weaponization and dissemination process.¹⁷⁴ One could surmise Endo had moral issue with WMD use and intentionally failed by utilizing the Sterne strain; however, given his involvement in the Sarin attacks and other crimes, that scenario seems implausible. If nothing else, Aum Shinrikyo was methodical, taking years to develop WMD capabilities. It displayed a track record of performing test runs prior to actual attacks. The Matsumoto Sarin attack that killed seven and injured approximately 150 individuals was described by cult members as a test run for the eventual Tokyo subway Sarin attack that occurred nine months later.¹⁷⁵

While it is reported that Aum Shinrikyo attempted to obtain other dangerous pathogens such as Q fever and Ebola Virus, no evidence has been found of success in obtaining them. The group desired to obtain and culture other bioagents, but it was unsuccessful in obtaining them in the first place.¹⁷⁶ Contrary to their experience with *Clostridium botulinum*, the leaders knew they could not and did not obtain or isolate these other agents so no further progress was made towards using them in the BW program.

Failure to obtain or isolate the desired pathogens spelled failure for the cult to tactically disseminate BW. Despite failure in this area, reviewing the group's ability to weaponize and employ speaks volumes towards actual and potential capability.

2. Weaponizing the Agents

The full ability of Aum Shinrikyo to weaponize anthrax and what it thought was botulinum toxin is not fully known. Due to Japanese police authorities being unaware of the cult's BW activities until well after the events took place, too much time elapsed

¹⁷³ Leitenberg, "Aum Shinrikyo's Efforts to Produce Biological Weapons," 149-153 and Paul Keim, et al., "Molecular Investigation of the Aum Shinrikyo Anthrax Release in Kameido, Japan," *Journal of Clinical Microbiology*, December 2001, vol. 39, no. 12, 4566-4567, <http://jcm.asm.org/cgi/content/abstract/39/12/4566> (accessed December 2006).

¹⁷⁴ Leitenberg, "Aum Shinrikyo's Efforts to Produce Biological Weapons," 153.

¹⁷⁵ Senate Government Affairs Permanent Subcommittee on Investigations, "Global Proliferation of Weapons of Mass Destruction."

¹⁷⁶ Broad, "How Japan Germ Terror Alerted World."

allowing for evidence to disappear.¹⁷⁷ Enough evidence was visible to produce a picture of capability in the weaponization process.

The cult's monetary assets were more than sufficient to procure the required items for weaponization. The group established an elaborate string of front companies to obtain laboratory and industrial equipment along with other necessities for safe production. For example, Japanese authorities located 160 18-liter drums holding the substance Peptone which is used for culturing bacteria. Normal university research laboratories only use one liter per year.¹⁷⁸ During other investigations, the police also found a four-story laboratory still incomplete that housed an elaborate set-up including, "a clean room, a filtration system for removing contaminants, and an air lock."¹⁷⁹ The cult had the material and equipment necessary to produce vast amounts of BW that when combined with a new, well-equipped laboratory indicate a latent, untapped capability.

Specifically in the case of anthrax, success in weaponizing the vaccine strain seems apparent. Liquid solution was located and archived by authorities at the site of one attack. When analyzed years later in 2001, the spores tested positive for the Sterne strain. No comment was made on the quality of the liquid solution collected (with regards to spore size), but it illustrates the fundamental ability to produce anthrax in some form in enough quantity for dissemination.¹⁸⁰

The agents selected by Aum Shinrikyo appear to have been economically feasible for production. The necessary equipment to weaponize the agents was economically and physically feasible to obtain, and the whole process was safe, relatively speaking. In contrast, the availability of technical expertise to weaponize the anthrax did not exist.

The major player in development, Seiichi Endo, was not a microbiologist and had little work experience in the field. As previously described, a heart specialist and physicist were the other prominent members of Asahara's inner group that had any

¹⁷⁷ Broad, "How Japan Germ Terror Alerted World."

¹⁷⁸ Kaplan, "Aum Shinrikyo," 214-215.

¹⁷⁹ Ibid.

¹⁸⁰ Keim, et al., "Molecular Investigation of the Aum Shinrikyo Anthrax Release in Kameido, Japan."

background compatible to working with BW. In reality, the true expertise needed from a microbiologist being on staff was lacking in this situation.

Three additional factors contributed to problems in the weaponization process. First, the group's leaders were educated individuals that may have been able to do the job correctly under the right circumstances. Endo and others were instead heavily tasked with multiple duties and required to focus on various types of apocalyptic weapons as directed by Asahara—nuclear, chemical, biological, laser, and earthquake-inducing weapons. As stated previously, Asahara tasked Endo to develop the Sarin for future attacks which effectively negated his ability to continue with BW development at that time. Second, with the type of atmosphere present in the cult, it is not surprising the scientists encountered difficulties that they could not overcome (at least not quickly). The culture of frequent drug use, sleep and food deprivation, and incessant fear of retribution for lack of full committal to the cult possibly caused stress levels incompatible with good scientific procedure.¹⁸¹ Third, as the time grew nearer to Asahara's personally prophesized Armageddon, he desired results quickly. When one technique failed, he pushed for something new. When BW failed multiple times, he switched the cult's focus from BW agents to chemical ones immediately.¹⁸² These same themes become apparent during the employment stage.

3. Employing Biological Weapons

Aum Shinrikyo attempted seven biological attacks from 1990 to 1995. Four were carried out with anthrax and three with botulinum toxin.¹⁸³

- April 1990: Botulinum toxin attack
- June 1993: Botulinum toxin attack
- June – July 1993: *Bacillus anthracis* attacks (two separate events)
- June – August 1993: *Bacillus anthracis* attacks (two separate events)
- March 15, 1995: Botulinum toxin attack¹⁸⁴

¹⁸¹ Richard A. Falkenrath, Robert D. Newman, and Bradley A. Thayer, *America's Achilles' Heel: Nuclear, Biological, and Chemical Terrorism and Covert Attack*, BCSIA Studies in International Security (Cambridge, Mass: MIT Press, 1998), 23-24.

¹⁸² Broad, "How Japan Germ Terror Alerted World."

¹⁸³ "Chronology of Aum Shinrikyo's CBW Activities," Center for Nonproliferation Studies, Monterey Institute of International Studies: 2001, 1, http://www.cns.miis.edu/pubs/reports/pdfs/aum_chrn.pdf (accessed December 2006).

The first two attacks attempted to employ botulinum toxin against multiple targets. The April 1990 attack was perpetrated from three trucks at multiple locations. The cult targeted Narita Airport, the Diet, the Imperial Palace, the headquarters of a rival religious organization, and two U.S. naval stations. The trucks utilized sprayers that could be used as the trucks drove by the target locations. The June 1993 attack was conducted with a sprayer from a car that could also be used as the vehicle passed the target. Prince Naruhito's wedding and its attendees were targeted this time.¹⁸⁵

The next four events involved the use of anthrax. The June to July 1993 attacks sprayed the agent from a building owned by Aum Shinrikyo—its new headquarters in Tokyo.¹⁸⁶ The attacks happened over a four day period from the roof of the eight-story building with a sprayer/fan device.¹⁸⁷ The June to August 1993 attacks were both perpetrated from a truck equipped with a device that sprayed the target in passing. The cult targeted the Japanese government legislature, the Imperial Palace, and the Tokyo Tower during two separate attacks.¹⁸⁸

The final attack happened on March 15, 1995 utilizing three briefcases modified with sprayers. They were placed near the Kasumigaseki, Tokyo subway station. The agent attempted to be employed was botulinum toxin.¹⁸⁹

The lack of physical effects on any person following all seven bioattacks indicates an absolute overall failure—tactical employment of a true biological weapon did not happen. No confirmed deaths or even sicknesses arose from the attacks during or in the days following (to allow for the incubation period of anthrax as described in Chapter III).¹⁹⁰ Aum Shinrikyo failed to employ BW but not necessarily due to a capability failure in the realm of employment. The cult did succeed in employing a non-virulent

¹⁸⁴ The list denotes the known attempted attacks that authorities directly attributed to Aum Shinrikyo. It leaves out multiple others that the group was possibly linked to or involvement is suspected yet not confirmed. “Chronology of Aum Shinrikyo’s CBW Activities,” 2-5.

¹⁸⁵ Ibid, 2.

¹⁸⁶ Ibid.

¹⁸⁷ Kaplan, “Aum Shinrikyo,” 216.

¹⁸⁸ “Chronology of Aum Shinrikyo’s CBW Activities,” 2.

¹⁸⁹ Ibid, 5.

¹⁹⁰ Kaplan, “Aum Shinrikyo,” 216-217, and “Chronology of Aum Shinrikyo’s CBW Activities,” 2-5.

form of anthrax. The overall reason for failure was the lack of obtaining a virulent strain of anthrax and failure to naturally isolate the bacterium *Clostridium botulinum* in the first place. The remainder of the discussion in this section addresses the cult's use of anthrax since the group actually obtained a strain of anthrax and brought that agent to fruition.

Although details of all transportation and dissemination devices are unavailable, one can assume from the multiple vehicle spraying attacks that the BW agent created was transportable making for a more covert delivery. Anthrax and botulinum toxin are both very persistent agents that if properly obtained and weaponized would have been excellent choices to create havoc in and around Tokyo. Natural immunity does not exist for either weapon so even crude dissemination tactics could have made an impact on Japanese society. This lack of natural immunity also played against the cult had they been employing virulent strains. Safety of those individuals releasing the agents would have been in question. Based on their crude employment techniques in the Sarin attacks, those cult members involved may have been infected by the weapons; however, unlike chemical weapons, it would not have interrupted the task due to the delayed onset of symptoms with biological agents.

The main problem with employment of the weapons (even the non-virulent anthrax) evolved within the dissemination technique—specifically the sprayers. The anthrax sprayers reportedly had clogging issues leading to less dispersion of the agent and most likely spore clumps exceeding the preferred one to five microns necessary to infect people efficiently.¹⁹¹ The attack from the roof of the cult's headquarters in downtown Tokyo reportedly had these issues, but that attack in and of itself raises questions again about the use of anthrax as a test run versus being an actual attack.

The two attacks taking place from its new headquarters building seem illogical with a pathogen such as anthrax, unless it is a non-lethal form such as the vaccine strain. To spray anthrax directly off the building would cause the entire external area of the building to be contaminated allowing no one to come and go freely without decontamination areas and protective suits. In addition, it would have required special modifications to the heating/air conditioning units so that they would filter out the

¹⁹¹ Leitenberg, "Aum Shinrikyo's Efforts to Produce Biological Weapons," 149-153.

pathogens and not pump them throughout the building. Both factors seem to indicate that the vaccine strain of anthrax was for testing purposes based on their track record of test runs and location of the attack coming off the top of the cult's own building. With many issues stacking up against the cult's tactical employment of BW, it still managed to pull together a rudimentary weapon—perhaps a very dangerous one had it actually been a different strain of anthrax.

D. CONCLUSION

1. Reasons for Program Termination

The question becomes: why did Aum Shinrikyo stop the BW development process? Two main reasons stand out as catalysts for this change in course or perhaps just a delay in development. First, due to the slow development process and failures by the bioweapons development team, Asahara became increasingly impatient for results. He wanted to change to something that was currently feasible—namely Sarin.¹⁹² Second, the cult became aware of an impending raid by Japanese police in early 1995 requiring them to utilize something that was already developed and proven—again Sarin.¹⁹³ It appears that its bioweapons research and development may have been temporarily put on hold but not terminated completely. During the raids following the Sarin attacks, Japanese police found the four-story laboratory still under construction 100 miles north of its Mt. Fuji compound in Naganahora. It was equipped with advanced systems for bioweapons development.¹⁹⁴ Had the raids not happened, the level of success in BW development may have been much higher over time if uninterrupted.

2. Capabilities Assessment

Aum Shinrikyo failed from the outset with botulinum toxin by not isolating it appropriately from the soil. The weaponization and employment that took place was futile based on this fact. No capability was displayed with this agent; however, the cult's experience with anthrax was different.

Had the group obtained a virulent strain of anthrax, the phenomenal laboratory facilities most likely would have enabled it to produce significant amounts of a dangerous

¹⁹² Broad, "How Japan Germ Terror Alerted World."

¹⁹³ Falkenrath, *America's Achilles' Heel*, 21.

¹⁹⁴ Kaplan, "Aum Shinrikyo," 213, and Broad, "How Japan Germ Terror Alerted World."

liquid-form agent. The cult successfully weaponized anthrax into a less than military-grade quality. When disseminated with the crude and malfunctioning sprayers, the non-virulent anthrax was dispersed and physically captured by authorities to prove it.

While capability issues arose in all three areas of BW development, it appears that in the case of anthrax, other issues hindered the group from achieving more success and possibly caused premature termination or at least postponement of the program. Since Japanese authorities raided Aum Shinrikyo compounds following the unrelated Sarin attacks, the world will never know if more time would have enabled even greater success.

The following chapter synthesizes a comprehensive list of capabilities displayed by the groups involved in the three case studies. From this list, a capabilities-based threat assessment is presented along with caveats this information brings with it. Finally, it makes recommendations for U.S. biodefense policy centered upon the findings in this study.

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V. CONCLUSIONS AND RECOMMENDATIONS

The three cases all portrayed considerable capability regardless of success or failure in tactical deployment of a weapon. Capability issues at times presented obstacles for the perpetrator(s) to overcome; however, other problems unrelated to capability ultimately caused some BW programs to be terminated. In those cases, aptitude in the three areas necessary for successful BW employment may have been a continuing obstacle, but that will never be known due to other circumstances causing either postponement of the program or ultimately the demise of the group.

This chapter begins by summarizing the capability revealed in the three case studies, and it identifies common abilities achieved among the perpetrators. Based on the findings, the effectiveness of a capabilities-based approach to risk is reviewed and how it might best be utilized in determining threat. An overall threat assessment is presented next, and biodefense policy recommendations in the areas of the nonproliferation regime, attribution, and future attack scenarios follow.

A. SUMMARY OF CAPABILITIES

1. Obtaining or Isolating Pathogens

In all three cases, this step appears to be the cornerstone to some level of bioterrorism success. All groups were able to weaponize and employ their weapons in some manner once able to *obtain* a pathogen. No group ever proved to actually *isolate* any bacteria or viruses. Aum Shinrikyo demonstrated that the ability to naturally isolate pathogens lays somewhere in the future for most terror groups due to the over-complexity of the task. As biotechnology quickly advances, this ability may become more promising to the untrained microbiologist, but it attested to the unlikely possibility in these cases.

Terrorist group capacity to gain access to dangerous pathogens is staggering. Both the Rajneeshees and Aum Shinrikyo enabled “legal” access to hazardous germs through their medical clinics, laboratories, and/or hospitals. Although the initial source of anthrax for the 2001 attacks is unknown, the study illustrated how lax security and shipping protocols were pre-9/11, how numerous locations were shipped anthrax from the late 1970s to early 1990s, and how even in the years following the attacks in late 2001,

many U.S. universities' lab security procedures were still insufficient. Perhaps even more precarious are the vast number of germ banks worldwide and how thousands of them are considered deficient in security controls.

In Aum Shinrikyo's situation with anthrax, it is unknown whether the group intentionally obtained a non-virulent form to initially work with for testing and experimentation purposes, or if the individual tasked to steal the agent possibly made a mistake or developed cold feet in the process. In any of these scenarios, the group still had legal access to obtain dangerous pathogens. No matter how it came to be that Seiichi Endo ended up working with the Sterne strain, the fact still remains that the capability existed to obtain hazardous agents, and although the anthrax was virtually harmless, the group successfully weaponized and employed it to some degree of success. This result again demonstrates the key to bioterrorism—obtaining a pathogen. If one was obtained, groups were able to accomplish destructive acts.

2. Weaponizing Agents

Two of the three cases illustrated definitive capability to weaponize salmonella and anthrax. The Rajneeshees produced liquefied salmonella in significant quantity to spread it throughout at least ten restaurants following minor test runs. The anthrax perpetrator(s) manufactured the weapon in a unique dry-powder form. The terrorist groups in these cases displayed two distinct methods of agent weaponization—capability is more than evident in both scenarios.

The case of Aum Shinrikyo is slightly different. If its weaponization of the non-virulent Sterne strain of anthrax was a test run or just a mistake, the world will never know without a doubt whether or not the group could have weaponized a harmful strain. Despite this, the cult weaponized the harmless anthrax strain in liquefied form for use in sprayers. Its ability to generate the weapon in this manner proved at least somewhat successful in that Japanese authorities found liquid samples of anthrax spores within the vicinity of the rooftop sprayer utilized in downtown Tokyo. Whether or not the weapon was employed successfully is a different matter, but based on this data, the group had the capability to weaponize the agent in a liquid form.

3. Employing Agents

The Rajneeshees and anthrax studies showed that the ability to employ the chosen agent was present in both situations. The employment methods were crude but effective. Their overall impact on society ranged from inundating public health systems, to economic fallout, to psychological influence. The Rajneeshee cult's basic method of dissemination of the liquid over salad bars and into coffee and salad dressing containers made at a minimum 751 people ill. The anthrax attackers' rudimentary envelope technique killed 5 people, sickened 17 others, and exposed an estimated 10,000 to the anthrax spores. Based on these results alone, the two perpetrators displayed capability to employ two very distinct germs in two unique styles.

Once again, the Aum Shinrikyo cult's experience with anthrax is distinctive. If one puts the non-virulent agent issue aside, the cult weaponized it to some success into liquid form for use in sprayers. Those sprayers spread an unknown quantity of anthrax; however, clogging problems were reported in all of the group's sprayer operations. Employment is deemed a success here with some capability demonstrated based on the authorities obtaining the anthrax samples at the sight of dissemination.

The clogging sprayers are an issue that the cult would have had to work through eventually to sufficiently spread a virulent form of anthrax. Had the compounds not been raided by Japanese police because of the unrelated Sarin attacks in 1995, the sprayer issues may have been overcome in one of two ways. First, this technical issue was probably the least of their problems from a BW perspective. With the presence of engineers and physicists, this would have been a more welcome and comfortable BW issue to work through than other microbiology specific problems. Second, the evolution of commercial sprayers and foggers would eventually have been investigated for use by the group. Even today, the availability of these devices for small amounts of money is frightening. Although anthrax sprayers must disseminate particles down into the one to

five micron range, modifications to already existing equipment are feasible. Many already advertise particulate sizes down to the 20 micron range with some openly advertising well under ten.¹⁹⁵

4. Common Capabilities and Trends

As mentioned previously, the foundation to successful BW employment appears to be obtaining a virulent pathogen. Once that happened in the Rajneeshee and anthrax cases, weaponization and employment in some form—even if crude or basic—happened successfully. In the case of Aum Shinrikyo, successful employment also followed in spite of the non-virulent anthrax strain. The capability to weaponize and employ agents emerges as a much smaller obstacle to success than actually obtaining the pathogen in the first place.

From a capabilities standpoint, this is extremely important from three perspectives. First, the ease in which groups acquired pathogens makes defending against bioterrorism an arduous task. It is the pivotal step in bioterrorism yet success came through several different avenues. The cases describe access to select agents such as anthrax and to less severe but deadly ones such as typhoid.¹⁹⁶ They also displayed access to much less virulent and very prevalent ones such as salmonella. With groups being able to acquire a broad spectrum of agents and make use of both the virulent and less virulent ones for terrorism, a broad capability exists to obtain pathogens—deadly and non-lethal ones.

Second, the apparent ease in every case to acquire the dual-use equipment necessary to weaponize the agents is surprising. The Rajneeshees used its medical corporation to get equipment and possibly procured other necessities through its

¹⁹⁵ One example of a commercial sprayer/fogger is available on the Ebay website for under \$170. See “Commercial Stationary Sprayer Fogger Free Shipping,” Ebay, http://cgi.ebay.com/COMMERCIAL-STATIONARY-SPRAYER-FOGGER-FREE-SHIPPING_W0QQitemZ130049749852QQcmdZViewItem (accessed November 2006). A second example sells for under \$500. See “Foggers,” Advance Greenhouses, http://www.advancegreenhouses.com/greenhouse_foggers_misters.htm (accessed November 2006). A final example sells for under \$4,300 and advertises particle sizes down to 8 microns. See “Curtis Dyna Fog Nightstar ULV Cold Mister,” Bugpage.com, <http://www.bugpage.com/xcart/product.php?productid=16150&cat=288&page=1> (accessed November 2006).

¹⁹⁶ For a complete listing of select agents classified by the CDC, see “HHS and USDA Select Agents and Toxins. 7 CFR Part 331, 9 CFR Part 121, and 42 CFR Part 73,” Centers for Disease Control and Prevention, Select Agent Program, <http://www.cdc.gov/od/sap/docs/salist.pdf> (accessed December 2006).

laboratories associated with the medical clinics without raising any alarms. The anthrax perpetrator(s) somehow did the same but with a leap in order of magnitude. The safety and containment equipment necessary to work with such a hazardous pathogen were somehow available and utilized well enough to again avoid detection by co-workers, suppliers, and/or authorities. Aum Shinrikyo utilized front companies and its legal medical organization status to obtain vast amounts of equipment and supplies. The cult was building a vast laboratory at the time it was raided by authorities. The small footprint and dual-use nature of the equipment necessary to weaponize agents helped enable this ability.

Third, the ability to disseminate the weapons without military-style tactics (e.g., aircraft equipped with sprayers or artillery shells/missiles laden with agents) is prevalent in all cases. Dropping liquid agent unsuspectingly into coffee creamer and salad dressing bottles and mailing envelopes with dry-powder anthrax allowed successful dissemination without attribution. Aum Shinrikyo utilized more complex spraying procedures that offered more hurdles; however, commercial sprayer technology or engineers associated with the program probably could have overcome those issues given more time and advancements in technology available to the general public.

The trend when reviewing these cases is summarized very simply—ease in acquisition, weaponization, and basic dissemination. Bioterrorism can be accomplished relatively easily after obtaining a pathogen that serves the group's purpose. The threat of bioterrorism continues to evolve especially as terrorists climb the capability learning-curve. The multiple capabilities revealed in this thesis in the areas of obtaining, weaponizing, and employing BW illustrate that terrorists are climbing that curve and finding ingenious ways to do so. A broad spectrum of capability exists today.

B. EFFECTIVENESS OF A CAPABILITIES-BASED APPROACH

This thesis finds a significant amount of capability to be in existence. Some might ask so what? Initially, the findings of this study might suggest bioterrorism is simple and when obstacles exist, they are easily overcome. A logical conclusion might be that the government must ascertain capability about every group remotely interested in BW, and then the threat can be effectively defended against. The results of this study suggest otherwise and answer the “so what?” question.

This thesis began with the assumption that motivation and intent of a group must be assumed from a policy perspective due to the number of terrorist groups and lone-wolf actors worldwide. To determine the intent of all is impossible leading one to the conclusion that it is vital to assume someone or some group has the intent. The results of this thesis reveal the same attributes for capability. In all three cases, surmising the ability of the groups to conduct BW research and master on some level the three areas required for BW employment was nearly impossible for authorities. Determining capability is just as difficult as determining motivation and intent for similar reasons.

Based on this information, a more general take on capability for threat assessment purposes must be taken in order to effectively utilize the results of this or similar studies and thereby make proper use of biodefense resources. Obviously, if specific BW capability information becomes available about a group or individual, that information combined with any knowledge of intent to use that capability or target certain vulnerabilities will significantly elevate the overall BW risk assessment for the time-being. Otherwise, a broad perspective on capability should be taken.

The capabilities displayed in the three case studies can be applied to any terrorist group with the intent to use BW tactics. Just as in the case of intent, knowing the actual level of capability by specific groups will be uncertain unless intelligence sources bring forth other information. By assuming interested groups today will have similar ease in acquisition of a pathogen and the subsequent weaponization and employment of the agent, a general but focused biodefense policy can be formulated.

Contrarian viewpoints from similar information have emerged. Perhaps the most vocal academic opponent to current biodefense policy is Milton Leitenberg. For example, he minimizes any BW capability possible by Al Qaeda in Afghanistan during the timeframe of 1997 to early 2002. According to Leitenberg, Al Qaeda had great interest in BW and specifically anthrax during this timeframe. U.S. forces uncovered evidence to support the group's interest and their subsequent research and development; however, that same evidence also showed that Al Qaeda members had been unable to acquire a deadly strain of anthrax for their program.¹⁹⁷ Based on this inability to obtain

¹⁹⁷ Leitenberg, *Assessing the Biological Weapons and Bioterrorism Threat*, 34.

anthrax, Leitenberg greatly downplays the threat posed by Al Qaeda and other terrorist groups such as Aum Shinrikyo. This study shows that once successful agent acquisition occurs weaponization and employment normally follow with some degree of success. Leitenberg's assumption that virtually no threat exists because a group could not acquire an agent for the time-being mischaracterizes the risk and fails to recognize the capability that a terrorist group can bring. A group that already has established intent and is actively researching within a BW program has been proven to already have significant capability. Based on the results of this thesis, a contrarian viewpoint to Leitenberg unfolds. Significant capability exists and could quickly manifest itself in the form of an actual attack if the group acquires a deadly or at least a serious germ such as salmonella to inflict mass effects. Actual demonstration of capability through manifestation of an attack should not be required to assume capability and therefore threat—biodefense policy demands a more thorough pre-judgment of that risk.

Even so, capability should not be the only factor considered for a threat assessment. The approach assumed in this thesis—intent and vulnerabilities always being existent—allows for the varying level of capability to drive the baseline biodefense policy. As stated, if a unique vulnerability comes to light or concrete intent is discovered to exist within a group, temporary changes in biodefense strategy and tactics must happen. In the meantime, a baseline strategy must be in place to deal with the nebulous bioterrorism threat. Aligning this policy against capability allows the most efficient use of the government and private sector's finite resources.

C. BIOTERRORISM THREAT ASSESSMENT

This thesis assumes motivation and intent to utilize bioterrorism will always be present by some individual or group. Al Qaeda reported its desire for both BW and nuclear terrorism as recently as September 2006. The thesis also assumes vulnerability to all types of terrorism will be present on some level. As Secretary of Homeland Security Chertoff stated, the country cannot afford to protect every vulnerability—it would bankrupt the U.S. government. Vulnerability to BW will always exist based on this and the wide spectrum across which BW can be implemented throughout society. As described by this study, capability existed and continues to persist today in the areas relating to biological weapons and use of them by terrorist groups.

It would be remiss and prove useless to classify the threat as high or low or somewhere in between. That type of characterization fails by either minimizing an actual threat or over-hyping it giving policy makers tasked with dealing with the problem improper guidance on the actual situation. A more useful description exists based on the assumptions of this thesis and the data collected in the case studies. A BW threat exists today. It is significant enough to address now before it becomes a grave threat in the future; however, that threat subsists in different form than that planned for by the U.S. government at present. This assessment of the risk more concretely describes it in a way that neither minimizes its severity nor over-emphasizes its importance over other national security issues. The question for policy makers is what to do with biodefense policy in light of this threat assessment. The following section provides recommendations to U.S. biodefense policy stemming from the results of this study.

D. POLICY RECOMMENDATIONS

The findings of this thesis and the subsequent threat assessment point to required improvements in three areas of U.S. biodefense policy: the nonproliferation regime, attribution capability, and perhaps most importantly, what attack scenarios should be focused upon for defense.

1. The Nonproliferation Regime

The case studies indicate that capability to conduct a BW attack increases immensely once a pathogen is obtained. Regardless of the quality of the weaponization or employment abilities of a group, normally an ability to conduct at least a basic attack will subsequently manifest itself. More stringent nonproliferation policies may not have prohibited the groups from obtaining potentially lethal pathogens since many such as salmonella are not on the select agent listing. Even so, strengthening international nonproliferation activities, such as those of the Australia group and the BTWC, will make it more difficult for terrorists to obtain these pathogens and the necessary equipment for weaponization in the future, especially in the international arena.

The Australia Group is the only entity in existence to help enforce any part of the BTWC. It formed in 1984 following UN investigation discovering Iraq's use of chemical weapons. The precursor chemicals and equipment necessary to produce these weapons were many times procured through legal international trade agreements so some countries

began to enforce more strict but non-uniform export controls. To standardize and streamline the process, Australia suggested the countries with these export controls to meet and solidify a single plan. Since then, the group has also adopted similar controls for dual-use equipment and biological agents. The group includes 39 countries in addition to the entire European Commission.¹⁹⁸ Increasing membership or mandatorily tying membership to signing the BTWC will help to ensure dangerous select agents and associated equipment are only being transferred legally to entities that have justifiable reasons to obtain them. Making the entry costs to biological terrorism with agents such as anthrax too high will help to either drive a group out of the bioterrorism group all together or require them to use less dangerous substances.

The BTWC currently has no verification protocols such as those enjoyed by the nuclear and chemical weapons nonproliferation regimes. Obviously, the small footprint and dual-use nature of manufacturing equipment combined with many countries' concerns about inspection on commercial companies make obtaining verification inspections difficult. This is highlighted, for example, by the United States backing away from the 2001 verification protocols suggested in the fifth review conference for the BTWC.¹⁹⁹ Verification inspections sound appropriate because the nuclear and chemical regimes utilize them; however, they may be impractical and inspecting only those countries that are already complying with regulations.

Based on the relative ease demonstrated in this case to culture the agents and employ them once they are obtained, the strengthening of the nonproliferation regime to prohibit future access of pathogens only seems logical. The best answer may be to rapidly push for tying the Australia Group against BTWC membership and subsequent approval of BTWC review conferences. This would bolster transparency and therefore security of the global trade and movement of harmful pathogens and associated equipment.

¹⁹⁸ "Origins of the Australia Group," The Australia Group, <http://www.australiagroup.net/en/origins.htm> (accessed December 2006).

¹⁹⁹ Christopher F. Chyba, "Toward Biological Security," in *Terrorism and Counterterrorism: Understanding the New Security Environment*, ed. Russell D. Howard and Reid L. Sawyer (Guilford, CT: MacGraw-Hill-Dushkin, 2004), 201.

2. Attribution

Attribution, let alone prevention, is extremely difficult in bioterrorism. When a group has the will, intent, and capability, the possibility of stopping them prior to a BW attack is minimal.²⁰⁰ If terrorists actually employ a weapon, attributing that attack is perhaps even more difficult. As for the Rajneeshees, the case would have conceivably gone unsolved forever had their leader not come forward and personally requested an investigation one year later.

In an interview at the time of the attacks, epidemiologist for the Oregon Health Division working the case, Dr. Laurence R. Foster, stated that the most likely hypothesis for the contamination came from a food service worker with diarrhea who handled the food thereby passing the salmonella bacteria on to whatever they touched. He also hypothesized that other sources could have been contaminated water, raw milk, or contact with pets suffering from diarrhea.²⁰¹ In a written statement in November 1984, Foster reiterated his comments, saying no evidence supported deliberate contamination and evidence pointed to food handling issues.²⁰² The idea of a bioterrorism event was not plausible at this point in history so it was quickly dismissed as a possibility and shows how difficult attribution of a bioterrorism incident can be.

Lack of attribution is perhaps the most disheartening fact from not knowing who committed the anthrax atrocities of 2001. After years of unprecedented investigations, the country has been unable to discern who conducted the attacks. Without this ability now and in the future, the U.S. government cannot retaliate nor have a valid deterrence against such attacks. The inability to attribute the attacks to anyone over the past five years is a nuance terrorists are sure not to have missed. Nuclear materials and conventional explosives leave tell-tale signs of where and how they were manufactured. Biological weapons rarely offer this same characteristic to investigators and policymakers who wish to pursue or punish those responsible for inappropriately using them.

²⁰⁰ Cole, “Bioweapons, Proliferation, and the U.S. Anthrax Attack.”

²⁰¹ “Illness Toll Rises to 264 in Salmonella Outbreak,” *Associated Press*, September 28, 1984, LexisNexis Database.

²⁰² Miller, Engelberg, and Broad, *Germs*, 23.

Attribution is an extremely difficult but important facet of biodefense and overall U.S. defense policy. Deterrence of attacks, if it can be done, requires an attribution capability.

The President's 2006 *National Strategy to Combat Terrorism* states, "...the rapid identification of the source and perpetrator of an attack will enable our response efforts and may be critical in disrupting follow-on attacks. We will develop the capability to assign responsibility for the intended or actual use of WMD via accurate attribution..."²⁰³ This strategy recognizes the attribution problem; however, as shown by the anthrax case study, the ability to actually carry out the assignment under the current intelligence, investigative, and public health structures is difficult if not impossible. Attribution networks must be developed for future biological weapon attacks and effective epidemiological response to natural outbreaks of widespread disease. By building these networks, it increases the ability to identify the agent, characterize the event as natural or terrorist, and attribute it to a person, organization or state. Policymakers will then have the ability to truly use deterrence as a tool against this type of terrorist tactic and respond in kind when attacks do occur.²⁰⁴ These same networks will also help in defending against future attack scenarios.

3. Defending Against Future Attacks

Jessica Stern, lecturer in Public Policy at the Belfer Center for Science and International Affairs at Harvard University, writes that terrorism is not a static phenomenon, and it tends to change via evolution rather than be revolutionary.²⁰⁵ Terrorism history supports this statement, and if it is to be believed, it suggests that bioterrorism is evolving much in the way that biotechnology is evolving. Revolutionary changes such as military-like precision attacks on a massive scale with select agents are probably not right around the corner but still something to be aware of by policymakers. Instead, the use of anything from simple pathogens to select agents on less hardened targets via basic employment techniques is more probable. Stern states, "Governments

²⁰³ *The National Strategy for Combating Terrorism*, Washington, D.C.: The Whitehouse, September 2006, 15, <http://www.whitehouse.gov/nsc/nsct/2006/nsct2006.pdf> (accessed December 2006).

²⁰⁴ For more information on attribution networks, see Anne L. Clunan, "Building Trusted Networks for Attributing Use of Biological Agents," paper presented at the Conference on Identification, Characterization, and Attribution of Biological Weapons Use, Center for Contemporary Conflict, U.S. Naval Postgraduate School and Kings College London, UK, July 12-13, 2006.

²⁰⁵ Stern, "Terrorist Motivations and Unconventional Weapons," 202.

should pay more attention to more likely kinds of attacks, which would kill tens or hundreds rather than millions. Such attacks could involve the use of low-technology dissemination devices to poison food, livestock, agricultural products..."²⁰⁶ Government defense against the Cold War bioagents such as anthrax should still be in place but with less focus. U.S. policy should move towards defending against a broad spectrum of lower impact attacks. Defending against these will actually improve the overall response to even more devastating attacks like one perpetrated with anthrax.

a. Simple Pathogens and Simple Delivery

The Rajneeshee attacks demonstrate how a simple pathogen such as salmonella can be easily obtained, weaponized, and disseminated efficiently using uncomplicated procedures. The group confirmed to future terrorists that widespread bioterrorism effects do not require obtaining a select agent such as anthrax, nor does it necessitate complex, military-style dissemination. The anthrax attacks illustrate terrorists may continue to move away from the tough issues of state bioweapons delivery systems in favor of these types of simple techniques and target less hardened infrastructure. The case suggests that one only needs to gain access to a pathogen and weaponize it to some basic level. Efficiency of the delivery system is not nearly as important. Aum Shinrikyo may have demonstrated this same concept. Despite its basic sprayers clogging, non-virulent anthrax was dispersed. With commercial technology evolution and the engineering background of several in the cult, more time to work out these issues could have enabled more effective systems as well.

b. Agroterrorism

Malcolm Dando believes that bioterrorism attacks in the next 15 years could not only be against humans but plants and animals as well.²⁰⁷ While this statement seemed to speak to specifically poisoning plants and animals for some gain, it also alludes to the idea of such things as agroterrorism to have a "weapon of mass disruption" type of effect. By poisoning food somewhere in the food chain from production through distribution channels, terrorists have a strong chance of impacting the economy and

²⁰⁶ Stern, "Terrorist Motivations and Unconventional Weapons," 203.

²⁰⁷ Malcolm Dando, "Bioweapons, Proliferation, and the U.S. Anthrax Attack," Conference on Terrorism, Transnational Networks, and WMD Proliferation: Indications and Warning in an Era of Globalization, Naval Postgraduate School, Monterey, CA: July 25-27, 2006.

American psyche in addition to making people sick if not causing outright death. The spinach *E. coli* outbreak during the fall of 2006 illustrates this point clearly with its large economic impact and direct affect on American's thoughts about the safety of their food.²⁰⁸ The Rajneeshee cult proved this type of attack to be simple to achieve on a large scale as well.

c. Smaller Objectives and Multiple Sites

All three cases put forth the lesson of targeting less likely objectives while hitting multiple locations. If a group attacked tens if not hundreds of small communities across the United States that were not the typically anticipated large targets such as New York, Los Angeles, or Washington, D.C., the overall effect would be amplified throughout the country. When a terrorist group can strike a small, middle-American town, it brings terrorism home to everyone's doorstep. The American public would collectively ask themselves if terrorists can strike their town next. Bioterrorism is a simple manner to accomplish this style of attack and does not require lethal select agents.

d. The Public Health System

Attacks that utilize rudimentary weaponization and employment techniques targeting less hardened and multiple targets are probably the near future for bioterrorism—mass effects rather than mass destruction. The threat assessment of this thesis stems from the capability already displayed to accomplish this sort of attack. Although smallpox, anthrax, and other dangerous agents still require the U.S. government's focus, consequence management or perhaps more specifically, epidemiological response in the form of the country's public health structure, should be bolstered.

As Stern writes, terrorism tactics evolve especially in the face of counterterrorism (CT) measures. Hijackings became more difficult due to CT policies so terrorists began blowing up airplanes. Governments responded to car bombs by putting up concrete barriers and made driving onto certain installations more difficult. In

²⁰⁸ Jane Zhang, "Politics and Economics: Food-Safety Concerns Extend Beyond California; Regulators Still Struggle To Discover The Cause of Spinach E. Coli Outbreak," *The Wall Street Journal*, September 18, 2006, A6, <http://proquest.umi.com.libproxy.nps.navy.mil/pqdweb?index=1&did=1128958471&SrchMode=1&sid=1&Fmt=3&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1160510048&clientId=11969> (accessed December 2006).

response, larger explosives such as truck bombs were used to increase the blast area.²⁰⁹ Terrorists will continue to improvise and evolve in bioterrorism as well. The capability suggested in the study displays the increased ability to obtain pathogens but still weaponize and employ them with basic, improvised methods—whether they are simple pathogens or select agents.

Government focus on improving the public health system to respond better to any large natural or man-made outbreak will improve the country's overall ability to deal with a biological attack in the future. The resulting biodefense focus becomes a plus not only in dealing with any type of attack, but it also increases the overall effectiveness of public health care offered to U.S. citizens. As of now, the government should move away from large research spending on anthrax and other such diseases and begin investing in the public health infrastructure and attribution networks. From post-9/11 through February 2006, the U.S. government had spent \$33 billion on biodefense with an estimated \$7 billion being spent annually.²¹⁰ A majority of this money is spent on research and development of and relating to select agents. Re-allocating money to more broad programs that will help the public health response to any incident is a more appropriate use of finite resources.²¹¹

This thesis developed a capabilities approach as a piece in assessing the overall bioterrorism threat from non-state actors. It assessed a broad spectrum of capability in all cases from obtaining pathogens to weaponizing and disseminating them. Based on this capability, the BW risk is assessed to be present but not something to over-exaggerate to subordinate other more pertinent national security issues. To adjust to this re-focused threat assessment, multiple recommendations have been made to U.S. biodefense policy. By improving U.S. efforts in the nonproliferation regime, increasing attribution capabilities to enhance deterrence and potential retaliation, and recognizing

²⁰⁹ Stern, "Terrorist Motivations and Unconventional Weapons," 216.

²¹⁰ Leitenberg, "Bioterrorism Hyped."

²¹¹ For more information on transforming the U.S. public health system to deal more effectively with biodefense and infectious diseases, see Brian Bennett, "U.S. Biodefense and Homeland Security: Toward Detection and Attribution," Naval Postgraduate School, Monterey, CA: December 2006.

the changing nature of future attacks, the government can more appropriately allocate resources that will not only enhance biodefense capabilities but also greatly improve the overall public health system.

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